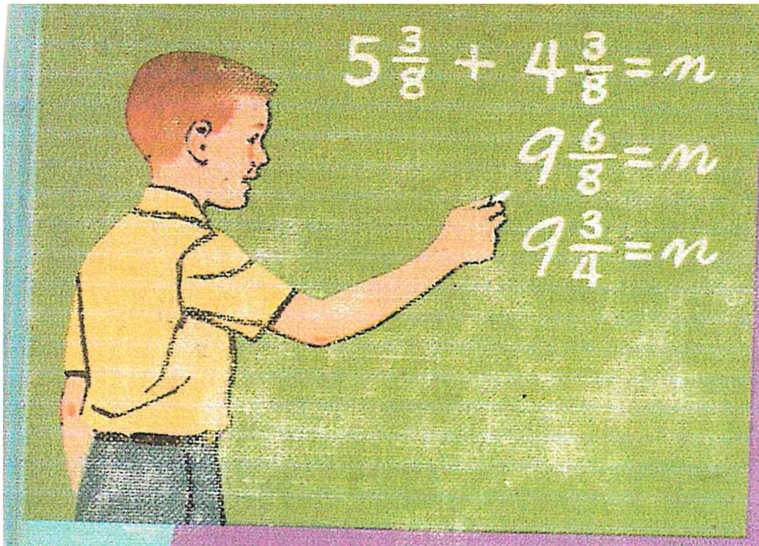

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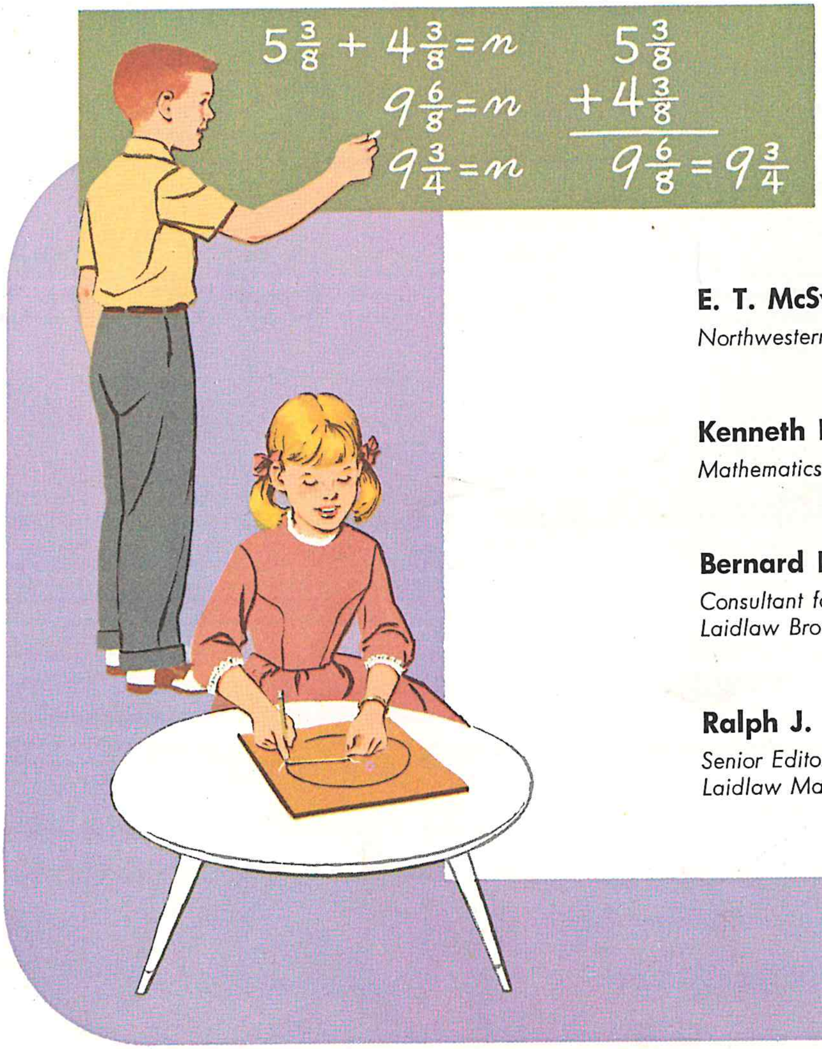

E. T. McSwain
Northwestern University

Kenneth E. Brown
Mathematics Specialist

Bernard H. Gundlach
Consultant for Mathematics
Laidlaw Brothers

Ralph J. Cooke
Senior Editor
Laidlaw Mathematics Series

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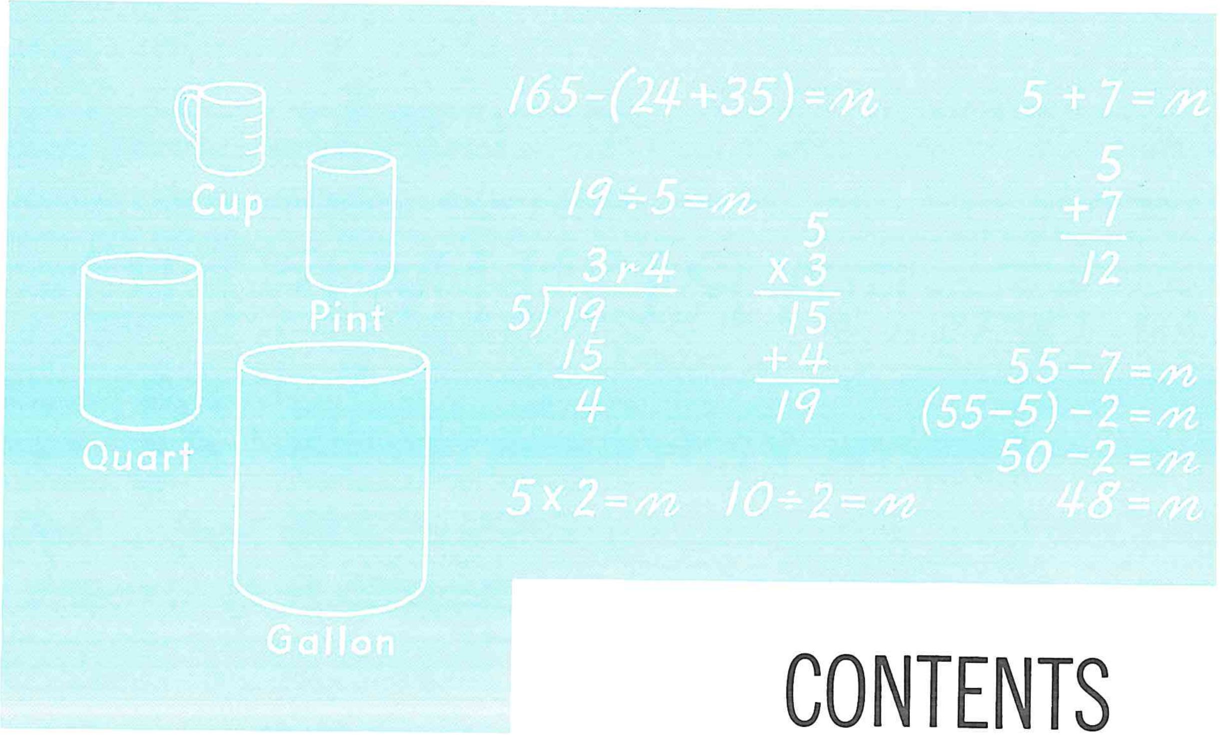

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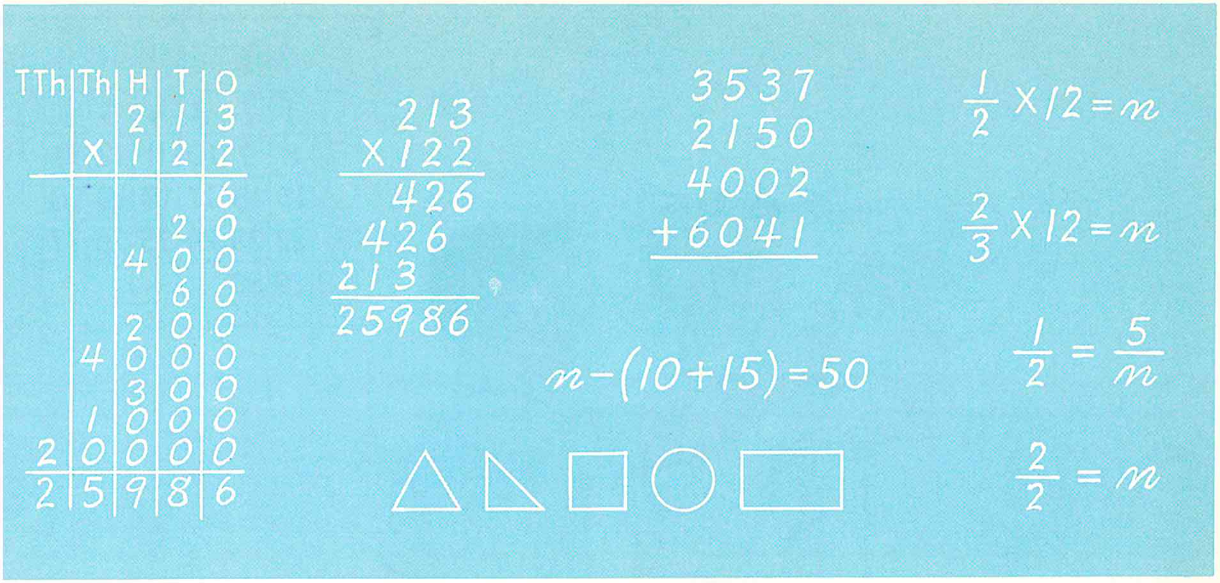

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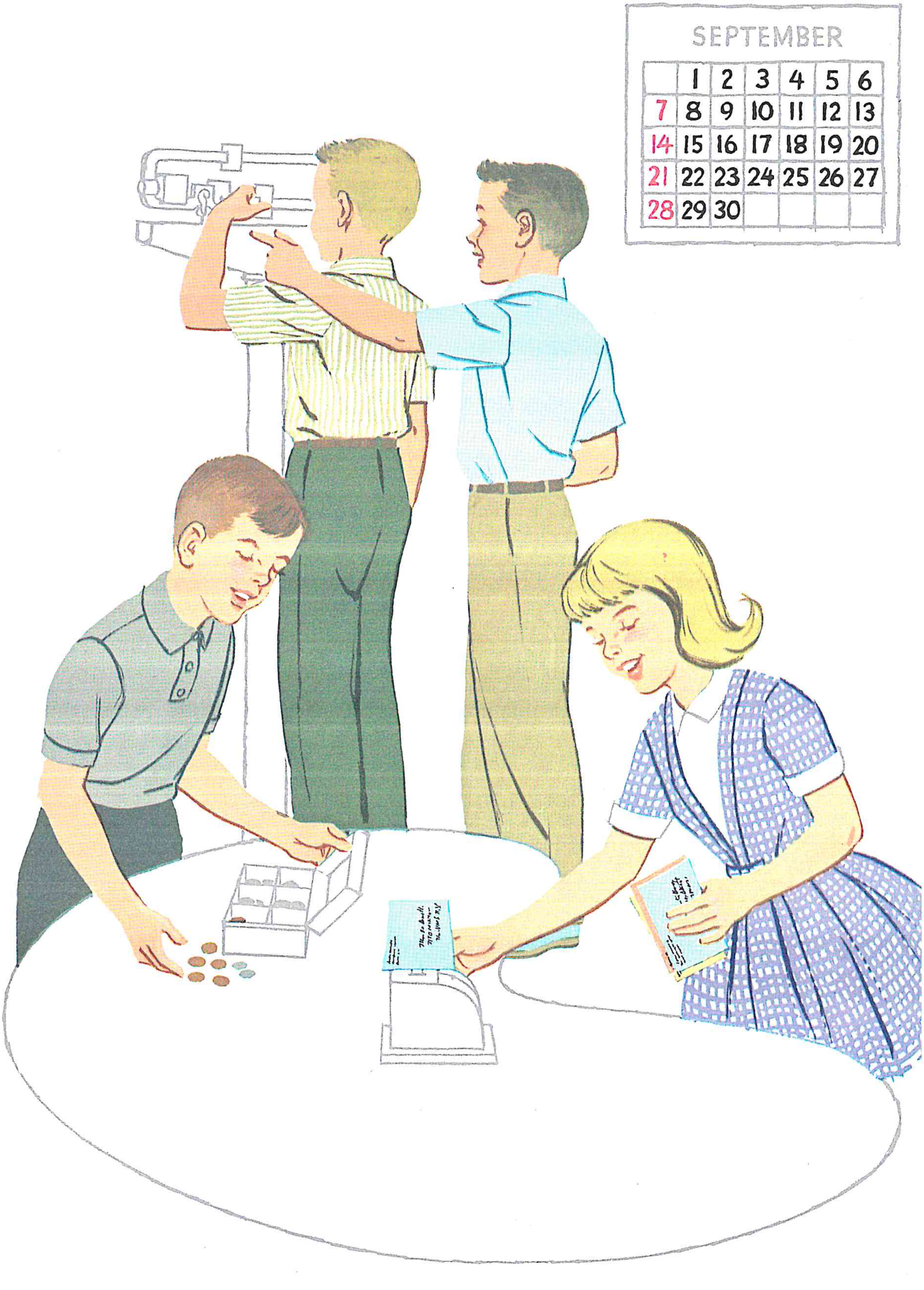
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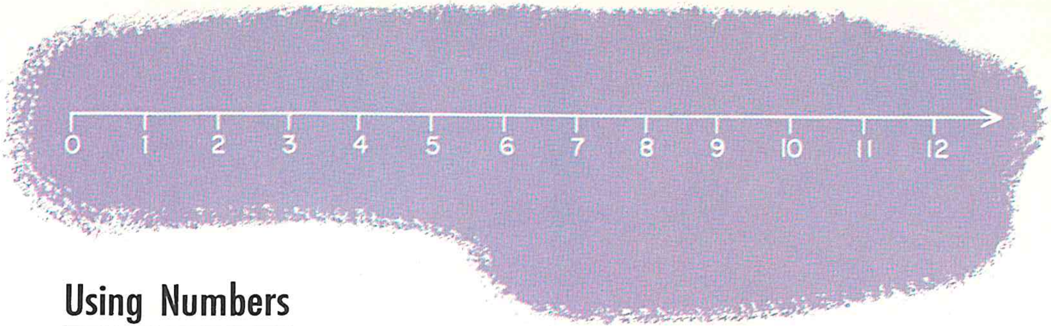
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30

1



Using Numbers

Think of ways in which you use arithmetic every day. Then answer these questions.

1. How many pupils are in your class?

2. How many inches tall are you?

3. How many days is it until the end of the month?

4. How many pounds do you weigh?

5. How much money do you need for an ice cream cone?

You can answer questions 1 to 5 above by counting. When you count, you use the **counting numbers.** The first counting number is 1. The second is 2. There is no last counting number, because there is always a counting number that is one more than the largest number you can think of.

The numbers from 0 through 12 are shown on the counting-line model above. Such a line is called a **number line.** The distance from 0 to 1 is labeled 1. The distance from 0 to 2 is labeled 2. You can see that $2=1+1$, $3=2+1$, $4=3+1$, and so on. As you move to the right on a number line, each number is 1 more than the number just before it.

You can express any number by using **digits.** The digits are given below. Notice the correct way to write each one.

0 1 2 3 4

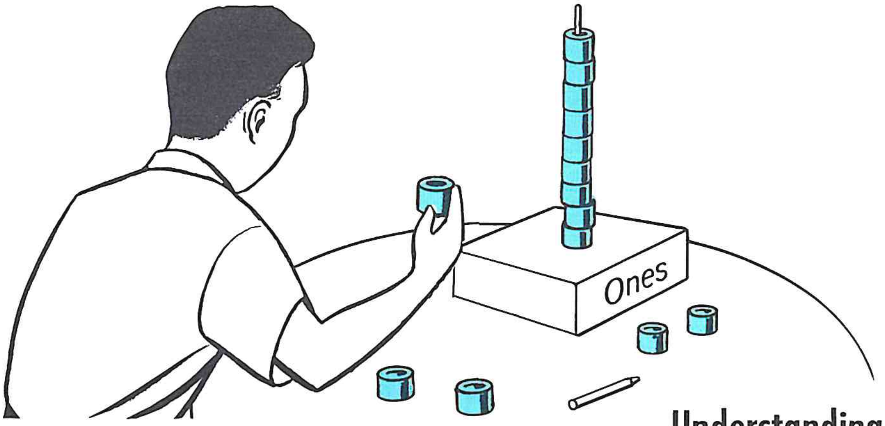
5 6 7 8 9

A kind of table called a **grid** shows clearly how digits are used in writing numerals. In the grids O stands for ones and T for tens.

Oral State which digit tells how many tens and which digit tells how many ones in each grid below.

T	O
1	5

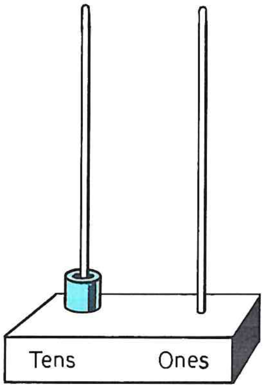
T	O
6	9



Understanding Place Value

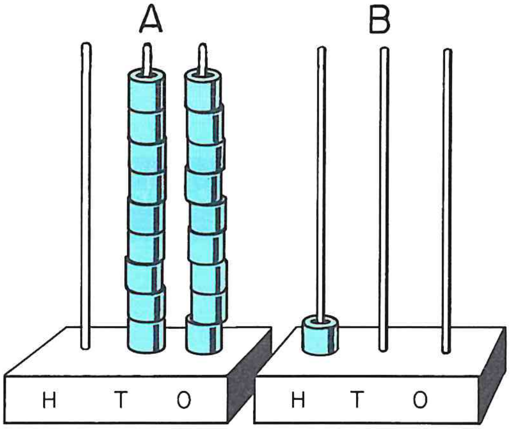
Bob has made an abacus to use in counting ones. A ring on the rod will stand for a one. There is just enough room on the rod for ten ones. Bob will need another rod on his abacus if he wishes to show a count beyond ten ones. This rod may be labeled tens because it will be used to keep a record of each set of ten ones.

Bob can use the ones and ten rods like this: Each time all ten rings are shown on the ones rod, he will take the ten rings off. He will put one ring onto the tens rod to help him remember the count of ten ones. Then he can use the ones rod again to count more ones. The abacus rods show that ten ones have a value of 1 ten and no ones, or 10.



A count of 11 would be shown as 1 ten and 1 one. A count of 12 would be shown as 1 ten and 2 ones. The record of any count from 1 through 99 can be shown on an abacus having a rod for tens and a rod for ones.

To show any count between 99 and 999, a third rod must be added to the abacus. This rod will be used to record each count of ten tens, or hundreds. On the abacus shown, H stands for hundreds.



The abacuses on page 6 show the record of a count to 99 and of a count to 100.

In A, 9 rings are shown on both the ones rod and the tens rod. As the next object beyond 99 is counted, these steps are taken:

a. A tenth ring is placed on the ones rod.

b. All ten rings are taken off the ones rod leaving it empty.

c. One ring is added to the tens rod as a *record* that the ten ones are to be thought of as one ten.

d. All ten rings are taken off the tens rod leaving it empty.

e. One ring is placed on the hundreds rod as a record of the ten tens which are to be thought of as one hundred.

Then the abacus appears as in B. The three parts of the abacus together show that ten tens have a value of 1 hundred, 0 tens, and 0 ones.

The grid can be thought of as a kind of abacus to use in making a record of a count. In the grid, Th stands for thousands, H stands for hundreds, T for tens, and O for ones.

Th	H	T	O
4	3	2	1

The number shown in the grid is read: Four thousand, three hundred twenty-one.

Oral Answer these questions.

1. How would you show a count of 11 on the abacus? How would you show a count of 12?

2. What is the largest possible number that you could record on an abacus with a rod for ones and a rod for tens? (Reminder: A full rod is *never* to be left standing, but *must* be recorded on the next higher rod as one.)

3. What is the largest possible number that you could record on an abacus with a rod for hundreds, a rod for tens, and a rod for ones?

4. What is the largest possible number that you could record on an abacus having a rod for thousands, hundreds, tens, and ones?

Written Write numerals to show each of the following.

1. 9 tens and 9 ones

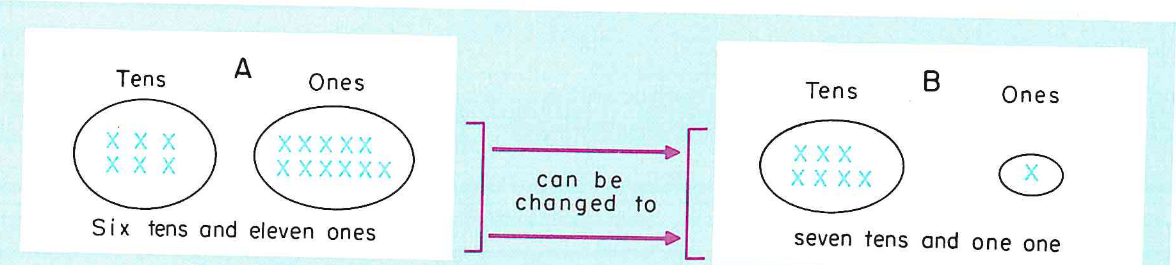
2. 6 thousands 0 hundreds 3 tens 1 one

3. 4 hundreds 6 tens 5 ones

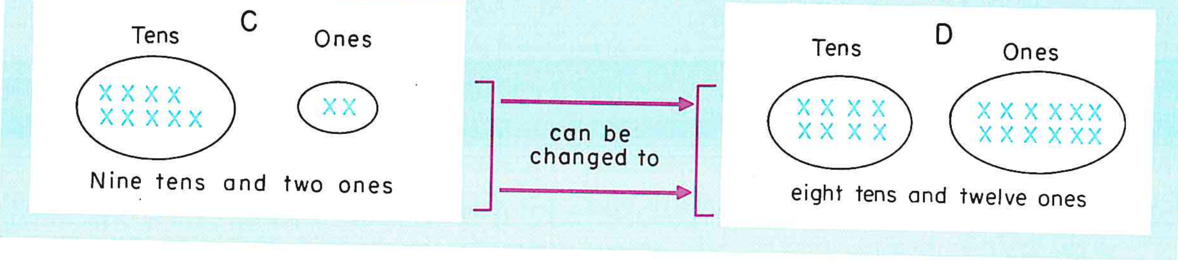
4. 9 ones

5. 2 thousands 9 hundreds 7 tens 5 ones

MORE PRACTICE PAGE 297



But when needed, we can also change in the other direction:



Changing the Form of a Number

In the above pictures each X represents a one or a ten, depending on its place.

Look at pictures A and B. They show two different forms for the same number or value, 71.

Look at pictures C and D. They show two different forms for the same number or value, 92.

Oral Answer the questions below.

1. How is picture B different from picture A?

2. How is picture C different from picture D?

Written Write the number word that belongs in each blank below.

1. Five tens and fifteen ones = ___ tens and five ones

2. Six tens and seventeen ones = ___ tens and seven ones

3. Eight tens and fourteen ones = nine tens and ___ ones

4. Seven tens and twenty-three ones = ___ tens and three ones

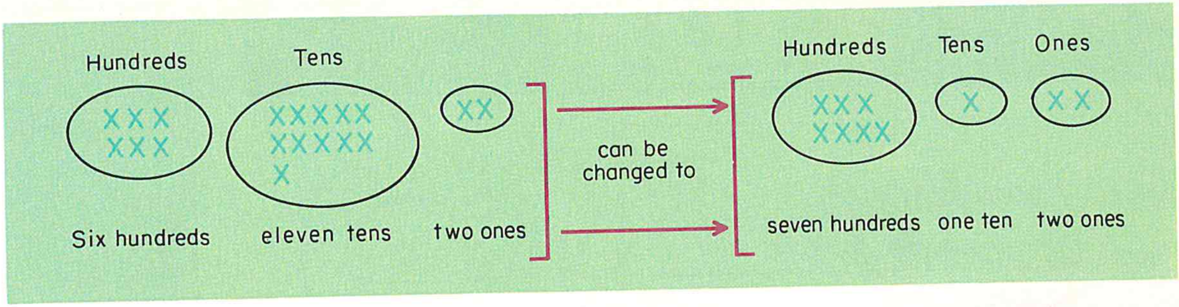
5. Two tens and thirty-five ones = ___ tens and five ones

6. Eight tens and three ones = seven tens and ___ ones

7. Three tens and eight ones = two tens and ___ ones

8. Two tens and four ones = one ten and ___ ones

9. Two tens and seventeen ones = ___ tens and seven ones



Changing the Form of Three-Digit Numbers

In the above picture, each X represents one or ten or hundred, depending on its place.

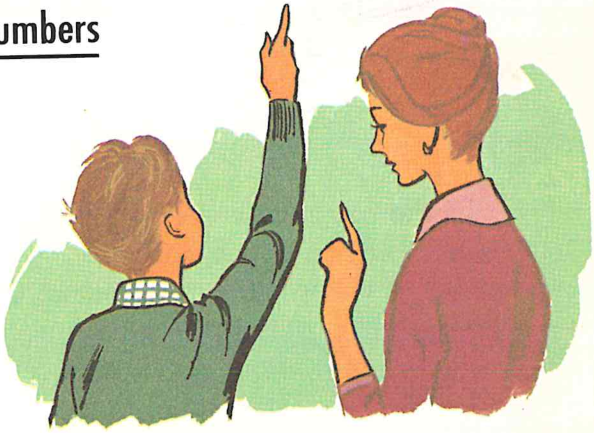
As you can see in the picture above, each ten tens can be changed to one hundred and added to the hundreds.

Oral Study the picture and then be ready to answer the following question:

What number word can you use to stand for the X's in each place?

Written Write the digit that belongs in each blank below. (There should be no digit greater than 9 in any blank.)

1. Five hundreds, fifteen tens, and four ones = ___ hundreds, ___ tens, and ___ ones
2. Seven hundreds, sixteen tens, and no ones = ___ hundreds, ___ tens, and ___ ones
3. Eight hundreds, seventeen tens, and five ones = ___ hundreds, ___ tens, and ___ ones



4. Five hundreds, four tens, and fifteen ones = ___ hundreds, ___ tens, and ___ ones
5. Two hundreds, eighteen tens, and nine ones = ___ hundreds, ___ tens, and ___ ones
6. Six hundreds, seven tens, and ten ones = ___ hundreds, ___ tens, and ___ ones
7. Two hundreds, fourteen tens, and eight ones = ___ hundreds, ___ tens, and ___ ones
8. Seven hundreds, four tens, and nineteen ones = ___ hundreds, ___ tens, and ___ ones

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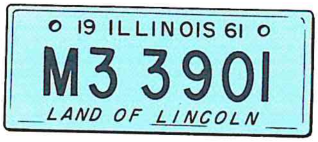
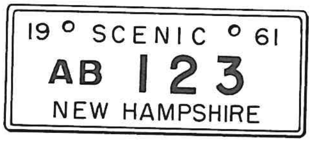
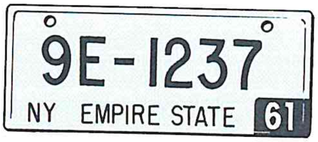
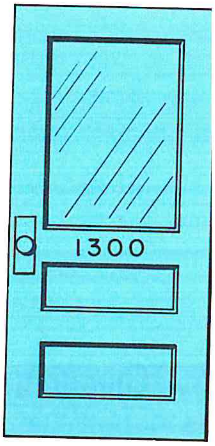






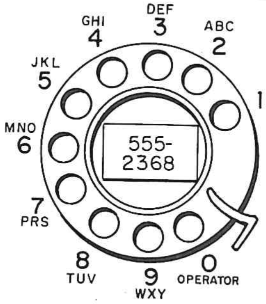


Name *Thomas, Carol*

Born *October 18, 1953*

Address *1228 Emerson Avenue*

Telephone *Hickory 2-5123*



In the principal's office there is a record card for every pupil in the school. The card for Carol Thomas, shown above, tells you that she was born on October eighteenth, nineteen hundred fifty-three. She lives at twelve twenty-eight Emerson Avenue. Her telephone number is Hickory two, five one two three.

To read dates, group thousands and hundreds together, and tens and ones together. Read 1953, for example, as *nineteen fifty-three,* or *nineteen hundred fifty-three.* Read 1418 as *fourteen eighteen,* or *fourteen hundred eighteen.*

House numbers are read the same way as the short way for dates. You read 6850 Cornell Avenue as *sixty-eight fifty Cornell Avenue.* Read 321 Harris Street as *three twenty-one Harris Street.*

Reading Numerals in Other Ways

Oral Read each of the following dates in two ways.

	a	*b*	*c*	*d*
1.	1861	1775	1920	1961
2.	1925	1090	1800	1492

Read each of the telephone numbers below.

3. Dorchester 3-5943

4. Poplar 5213

5. Village 8-2000

Read these house numbers in several ways.

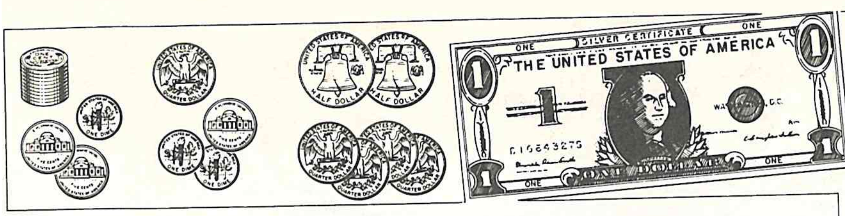
6. 1215 State Street

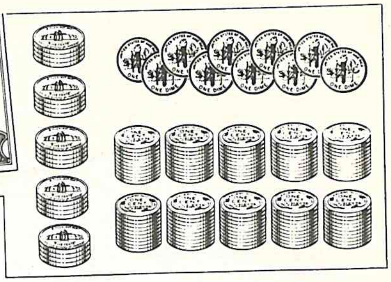
7. 721 North Grove Avenue

8. 1014 First Avenue

9. 2121 Sheridan Street

10. Now read each of the automobile license numbers at the top of the page.





Numerals and Number Words Used with Money

Use the above picture to answer the following questions.

1. How many nickels have the value of a dime? How many cents have the value of a dime?

2. According to the chart, which sets of coins have the purchasing value of a dollar?

3. Terry had a quarter. He needed change to make a telephone call, which cost a dime. What are three combinations of coins that would give him the right coin or coins for the telephone? (Hint: There are at least six possible combinations.)

The chart below shows you how much you can save in a year if you save the same amount of money each week. For example, if you save $.10 a week, you will have $5.20 at the end of a year. Saving $.25 each week gives you $13.00 at the end of the year.

Weekly Savings Chart

If you save weekly	At the end of one year you will have
$.10	$ 5.20
.25	13.00
.50	26.00
.75	39.00

The period, or point, (.) used in money numerals separates dollars from cents. The digits on the left of the point mean dollars; the digits on the right of the point mean cents. The point is read as *and* only when the digits on the right of it are not all zeros.

$13.00 is read *thirteen dollars.*

$13.25 is read *thirteen dollars and twenty-five cents.*

$13.08 is read *thirteen dollars and eight cents.*

Oral Read, think, and do.

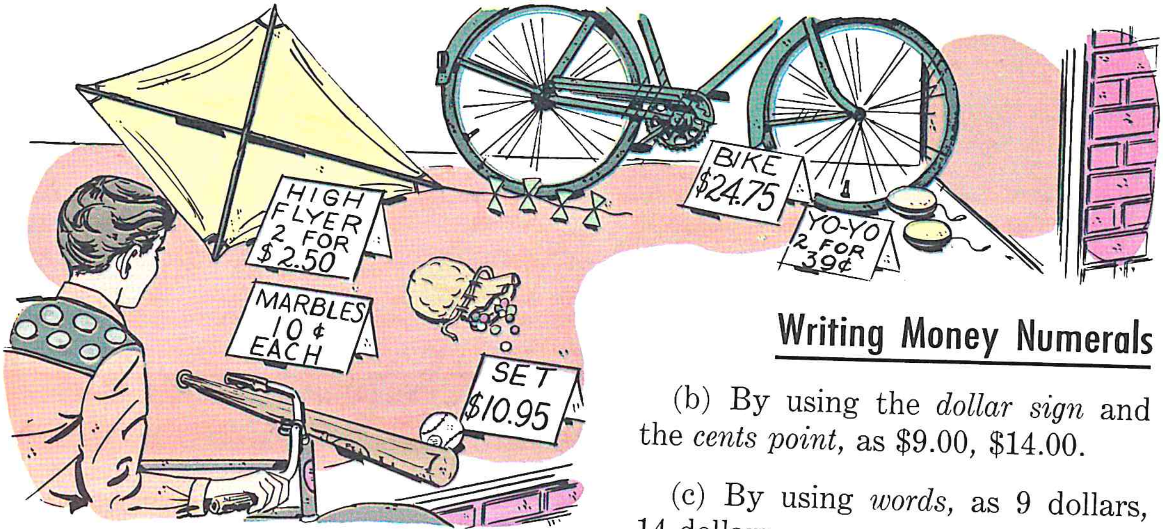
Use the chart in column one to answer the following questions.

1. If you save $.50 weekly, how much will you save in a year?

2. To save $39.00 a year, how much must you save each week?

Read these money numerals.

	a	*b*	*c*
3.	$12.00	$.98	$10.27



Writing Money Numerals

Look at the picture above. Then be prepared to answer the following questions by reading the prices on the tags.

1. Which price tags show prices of less than a dollar?

2. Which price tags show prices of a dollar or more?

Cents may be written in three different ways:

(a) By using the *cent sign* (¢), as 7¢, 65¢.

(b) By using the *dollar sign* and the *cents point*, as $.07, $.65.

(c) By using *words*, as 7 cents, 65 cents.

Dollars may be written in three different ways, also:

(a) By using the *dollar sign*, as $9, $14.

(b) By using the *dollar sign* and the *cents point*, as $9.00, $14.00.

(c) By using *words*, as 9 dollars, 14 dollars.

Dollars and cents are written and read together in the following ways:

(a) $8.09—Eight dollars and nine cents.

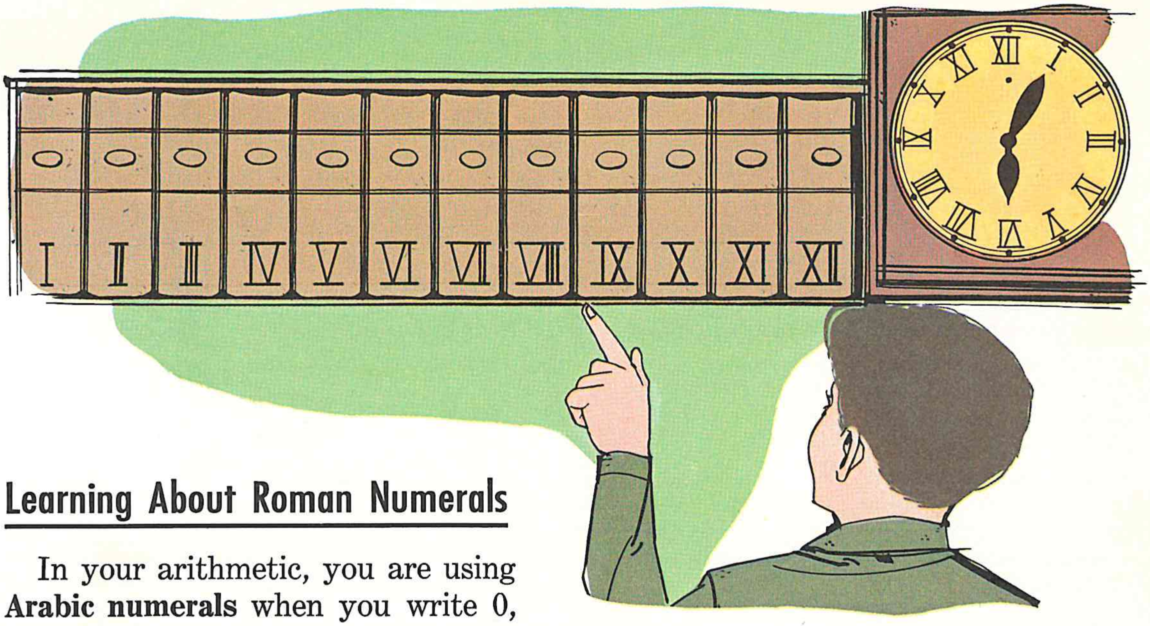
(b) $60.55—Sixty dollars and fifty-five cents.

(c) $327.40—Three hundred twenty-seven dollars and forty cents.

Written Write the following amounts of money, using numerals, the dollar sign, and the cents point.

1. Ninety-one cents
2. Fifty dollars and one cent
3. Thirty cents
4. Seventy-five cents
5. Sixteen dollars and no cents
6. Two dollars and ten cents
7. Seven cents

MORE PRACTICE PAGE 297



Learning About Roman Numerals

In your arithmetic, you are using **Arabic numerals** when you write 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

There is another way of expressing numbers. Look at the picture at the top of the page. The numerals on the clock and on the books in the set of books on the shelf are called **Roman numerals.** They are called Roman numerals because they were first used by the ancient Romans.

The three Roman numerals I (for 1), V (for 5), and X (for 10) are used to write all Roman numerals from 1 through 39.

In Arabic numerals, you must give attention to place value. Each 2 in 22 has a different value.

In Roman numerals, the symbols always have the same value. Thus II = 1 + 1 or 2; III = 1 + 1 + 1 or 3; XI means 10 + 1 or 11.

In a Roman numeral such as IV or IX, the I is written to the left of the V or the X. Such an arrangement indicates subtraction. For example, IV means 5 − 1 or 4 and IX means 10 − 1 or 9. More than one I used in this way has no meaning.

Written Write the following Roman numerals as Arabic numerals.

	a	*b*	*c*	*d*
1.	VIII	IX	III	XII

Write the following Arabic numerals as Roman numerals.

	a	*b*	*c*	*d*
2.	5	7	4	10

3. Write the Roman numerals in order from 1 through 12.

XI = 11 (10+1)
XII = 12 (10+2)
XIII = 13 (10+3)
XIV = 14 (10+4)
XV = 15 (10+5)
XVI = 16 (10+6)
XVII = 17 (10+7)
XVIII = 18 (10+8)
XIX = 19 (10+9)
XX = 20 (10+10)

XXI = 21 (20+1)
XXII = 22 (20+2)
XXIII = 23 (20+3)
XXIV = 24 (20+4)
XXV = 25 (20+5)
XXVI = 26 (20+6)
XXVII = 27 (20+7)
XXVIII = 28 (20+8)
XXIX = 29 (20+9)
XXX = 30 (20+10)

More About Roman Numerals

The Roman and Arabic numerals for eleven through thirty are shown on the above chart. The Roman numerals through twenty are formed by writing the numerals I through X (1 through 10) to the right of the numeral X.

The Roman numerals for twenty-one through thirty are formed by writing the numerals I through X to the right of the numeral XX. How will you form the Roman numeral for 30? For 32? For 39?

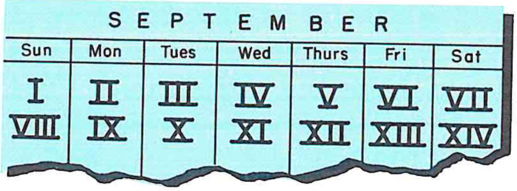
Written Write the following Arabic numerals as Roman numerals.

	a	*b*	*c*	*d*
1.	13	18	25	29
2.	30	33	35	39

Write the following Roman numerals as Arabic numerals.

	a	*b*	*c*	*d*
3.	XIX	XXIV	XX	XXV
4.	XXVI	XXXIII	XV	XXVIII

Something to make Using squared paper that is 7 squares wide and 5 squares deep, make a calendar for this month, using Roman numerals instead of Arabic numerals to indicate the dates. Use the beginning of a calendar below as your model.



SEPTEMBER

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
I	II	III	IV	V	VI	VII
VIII	IX	X	XI	XII	XIII	XIV

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. The counting numbers begin at 1. There is no last counting number. No matter how far you count, there is always one more. (5)

2. The digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are all that are needed to write any numeral. (5)

3. The form of a number can be changed. (8,9)

4. The point (.) is used to separate dollars from cents. (11)

5. Arabic numerals have place value, Roman numerals do not. (13)

Words to Know

1. Number line (5)

2. Counting numbers (5)

3. Digits (5)

4. Grid (5)

5. Arabic numerals (13)

6. Roman numerals (13)

Questions to Discuss

1. What do the 1 and the 0 in 10 tell you? (5,6)

2. What does each zero in 100 tell you? (7)

3. How many thousands are there in 4321? How many hundreds? How many tens? How many ones? (7)

4. What do the digits in each one of the following numerals tell you? 8, 37, 999, 5682. (7)

5. What number has a value of six tens and eleven ones? (8)

6. How do you read 1963 as a date? As a telephone number? As a house number? (10)

7. How do Roman numerals differ from Arabic numerals? (13)

Written Practice

1. Write the name of the largest possible two-digit number. (6)

2. Write the combinations of coins that have the value of a dime. (11)

3. Write ten cents in 3 ways. (12)

4. Write five dollars in 3 ways. (12)

5. Write the Roman numerals for 1, 4, 8, and 14. (13,14)

6. Write the Roman numerals for 11, 21, and 31. (14)

7. Write the Arabic numerals for IX, XIX, and XXIV. (13,14)

Self-Evaluation

Part 1 Write each of the following as a numeral.

1. 4 tens and 6 ones
2. 7 tens and 0 ones
3. 3 hundreds, 5 tens, and 6 ones
4. 4 thousands, 6 hundreds, 5 tens, and 0 ones
5. 8 thousands, 0 hundreds, 0 tens, and 5 ones
6. 5 tens and fifteen ones
7. 8 tens and eleven ones
8. 6 hundreds, eleven tens, and 0 ones

Part 2 Use number words in writing each of the following sentences.

1. The date is 1963.
2. My home is at 1819 Sheridan Avenue.
3. My telephone number is Chestnut 6-5918.
4. There are 1578 pupils in the high school.
5. Our city now has 8900 people in it.
6. Mary has $.91.
7. I have $1.03.

Part 3 Use numerals, the dollar sign ($), and the cents point (.) to write each of the following as a money numeral.

1. Fourteen dollars and seventy-four cents
2. Nineteen cents
3. Twenty dollars and five cents
4. Fifty-seven dollars and fifty cents
5. Nine cents

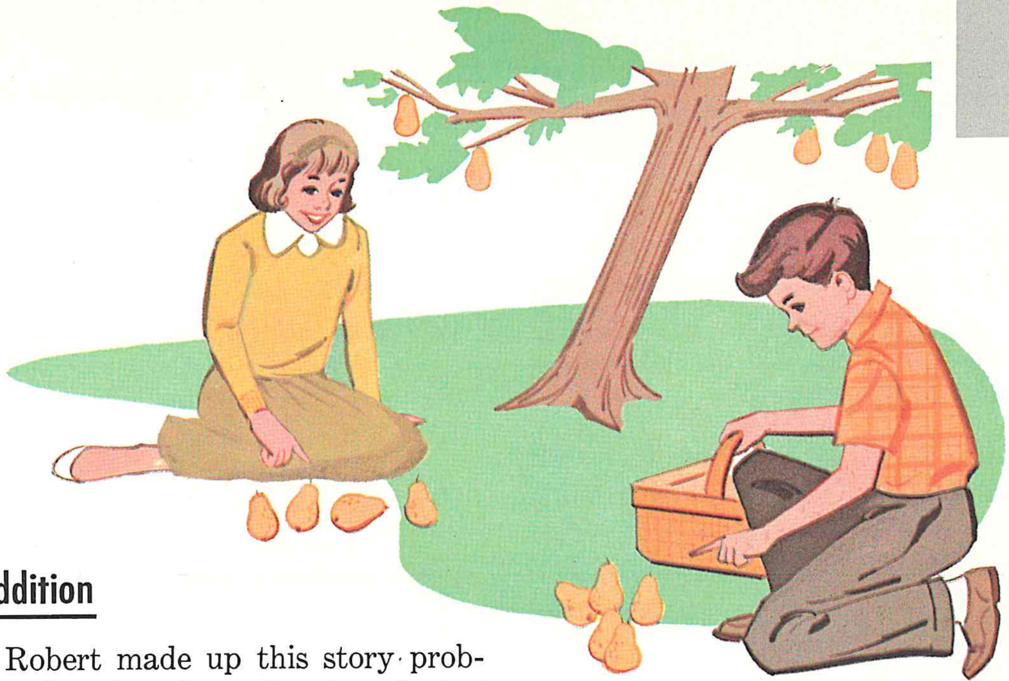
Part 4 Write each of the following first in Arabic numerals and then in Roman numerals.

1. Two
2. Four
3. Six
4. Nine
5. Fourteen
6. Nineteen
7. Twenty-one
8. Twenty-five
9. Thirty-seven
10. Thirty-nine

Part 5 Write the answer to each question below.

1. Mary's savings bank takes only dimes. She got change for a half dollar in dimes. How many dimes did she have for her bank?
2. How many dimes could Mary get in change for 20 pennies?

2



Addition

Robert made up this story problem for the class: Janet picked 4 pears and Bob picked 5 pears. How many pears did they pick together?

Robert told a story. Then he asked a question that could be answered by doing something with the numbers in his story.

To answer his question, you must think of the pears as being joined together in a group, or set. Therefore you are to add the numbers in the problem.

Robert's problem can be written in the language of arithmetic by using only numerals and signs, like this: $4+5=\square$.

Think of a box like $\square$ as holding the place for a numeral.

Read the statement $4+5=\square$, "Four plus five equals how many?"

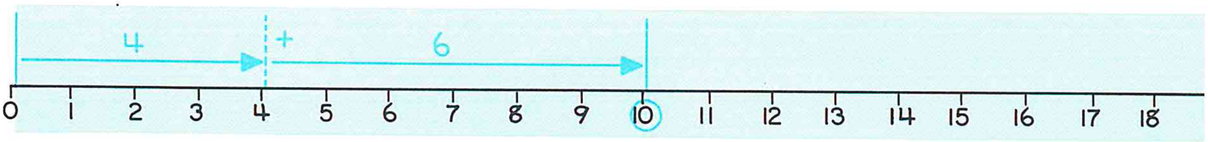
Which word in the above sentence is used in place of the sign + in the arithmetic statement? In place of the sign =?

The arithmetic statement for the problem can also be written in column form as shown.

$$\begin{array}{rl} 4 & \text{addend} \\ +5 & \text{addend} \\ \hline 9 & \text{sum} \end{array}$$

What name is given to the numbers that are added?

What name is given to the number you obtain by adding?



Reviewing Addition—Sums Through 10

The addition of 4 and 6 is shown on the number line. The sum, 10, is reached in two steps. The first step is from 0 to 4. The second step is from 4 to 10.

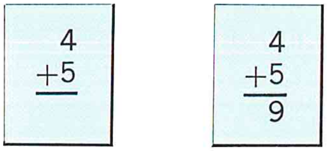
Oral Name the number that each ☐ stands for. Use the number line for help only if you need it.

	a	*b*
1.	6+3=☐	6+☐=9
2.	7+2=☐	7+☐=9
3.	5+3=☐	5+☐=8
4.	4+2=☐	☐+2=6
5.	3+5=☐	☐+5=8

Written Copy. Find each sum. Check your addition by adding the addends in another way, 4+3=7 and 3+4=7.

	a	*b*	*c*	*d*
1.	3 +4	5 +1	5 +5	4 +6
2.	9 +1	8 +1	5 +2	2 +6
3.	7 +1	5 +4	3 +2	4 +5
4.	1 +1	6 +1	2 +7	2 +8
5.	4 +6	1 +3	6 +4	4 +3
6.	1 +8	7 +3	3 +6	1 +9
7.	1 +2	1 +7	1 +4	1 +6
8.	2 +3	4 +4	2 +1	3 +3
9.	1 +5	3 +1	2 +2	2 +4
10.	4 +1	2 +5	8 +2	3 +7
11.	4 +2	6 +3	7 +2	2 +6

Something to do Using addition practice cards like those shown below will help you learn to add quickly.



Front Back

Reviewing Addition—Sums of 11 Through 18

Oral Name the number that each $\square$ stands for. The number line on page 18 may help you.

	a	*b*
1.	$2+9=\square$	$9+2=\square$
2.	$3+8=\square$	$8+3=\square$
3.	$3+9=\square$	$9+3=\square$
4.	$4+7=\square$	$7+4=\square$
5.	$4+8=\square$	$8+4=\square$
6.	$4+9=\square$	$9+4=\square$
7.	$5+6=\square$	$6+5=\square$
8.	$5+7=\square$	$7+5=\square$
9.	$5+8=\square$	$8+5=\square$
10.	$5+9=\square$	$9+5=\square$
11.	$6+6=\square$	$7+7=\square$
12.	$8+8=\square$	$9+9=\square$
13.	$6+7=\square$	$7+6=\square$
14.	$6+8=\square$	$8+6=\square$
15.	$6+9=\square$	$9+6=\square$
16.	$7+8=\square$	$8+7=\square$
17.	$7+9=\square$	$9+7=\square$
18.	$8+9=\square$	$9+8=\square$

Do you see that if you forget the sum as in 2+9, you might be able to find the sum by changing the order of the addends?

Written Write each statement in rows 1 through 18 in column form with its sum. Make practice cards for any addition fact that is hard for you.

Another way Look at the statement $7+8=\square$. You can rewrite it $7+(3+5)=\square$, because $3+5=8$.

$7+(3+5)=\square$ becomes $(7+3)+5=\square$, because you can regroup addends. Does $(7+3)+5=\square$ become $10+5=\square$? The value of $\square$ is 15.

How was each addition below done?

$$\begin{aligned} 3+9&=\square\\ 3+(7+2)&=\square\\ (3+7)+2&=\square\\ 10+2&=\square\\ 12&=\square \end{aligned} \qquad \begin{aligned} 8+6&=\square\\ 8+(2+4)&=\square\\ (8+2)+4&=\square\\ 10+4&=\square\\ 14&=\square \end{aligned}$$

Find each sum using the way shown above.

	a	*b*
1.	$6+5=\square$	$7+7=\square$
2.	$8+4=\square$	$5+7=\square$
3.	$9+8=\square$	$8+7=\square$

Adding One-Digit and Two-Digit Numbers

Patsy used 32 yellow beads and 6 blue beads to make a necklace. How many beads in all did she use? The yellow beads and the blue beads must be put together; so you add.

In the language of arithmetic, the problem may be written either as 32+6=☐ or as 32+6=n. From now on, n will be used instead of ☐. The letter n is used to hold the place for a numeral whose value you are to find.

You may be able to think the sum in one step: 32+6=38. Another way to find the sum is first to write the arithmetic statement in column form in a grid as shown in A. In the grid, T stands for tens; O stands for ones. Add this way:

A

$$\begin{array}{r|l} \text{T} & \text{O} \\ 3 & 2 \\ + & 6 \\ \hline 3 & 8 \end{array}$$

Ones: 2 ones + 6 ones = 8 ones. Write 8 in ones place in the sum.

Tens: There are no tens to add to 3 tens. Write 3 in tens place in the sum. The sum in this addition is 3 tens and 8 ones or 38.

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In the statement 37+5=n the sum of ones is more than 9.

The arithmetic statement can be written in column form as shown in grid B. Add this way:

B

$$\begin{array}{r|l} \text{T} & \text{O} \\ {\scriptstyle 1} & \\ 3 & 7 \\ + & 5 \\ \hline 4 & 2 \end{array}$$

Ones: 7 ones + 5 ones = 12 ones. Change the form of 12 ones to 1 ten and 2 ones. Write 2 in ones place in the sum. Remember 1 ten. (In grid B the little numeral 1 in tens place is a reminder.)

Tens: 1 ten remembered+3 tens= 4 tens. Write 4 in tens place in the sum.

Oral Be ready to tell how you would do each column addition below.

	a	*b*	*c*	*d*
1.	34 +3	52 +6	43 +5	75 +3
2.	64 +9	87 +5	72 +9	56 +7

Written Copy. Find each sum. Check.

	a	*b*	*c*	*d*
1.	5 +24	44 +5	85 +2	53 +3
2.	4 +77	56 +7	64 +8	86 +6

Adding Three or Four Addends

A statement like 4+3+2=n can also be written in column form, as shown below. Find the sum in two steps, because you can add only two numbers at a time. One way to find the sum is shown.

$$\begin{array}{r} 4 \\ 3 \\ +2 \\ \hline 9 \end{array}$$

Add 4+3=7. Remember 7. Add 7+2=9. The sum is 9.

To check, add up. 2+3=5. 5+4=9.

Look at the statement 2+0+3+5=n. It is written in column form below. How many addends do you see? One of the addends is 0. When you add 0 to a number or a number to 0, you do not change the number. Do you see that 2+0=2? Add 2+3=5. 5+5=10. The sum is 10.

$$\begin{array}{r} 2 \\ 0 \\ 3 \\ +5 \\ \hline 10 \end{array}$$

How would you find the sum of 2, 3, 0, and 5?

Oral The same numbers are used in each pair of columns below. What do you notice about each sum?

$$\begin{array}{rrrr} a & b & c & d \\ 3 & 3 & & \\ 0 & 4 & 2 & 2 \\ 2 & 2 & 3 & 4 \\ +4 & +0 & +4 & +3 \\ \hline \end{array}$$

Written Copy. Find each sum.

$$\begin{array}{lrrrr} & a & b & c & d \\ \textbf{1.} & 3 & 6 & 3 & 4 \\ & 2 & 2 & 2 & 1 \\ & +2 & +0 & +4 & +1 \\ \cline{2-5} \\ \textbf{2.} & 4 & 5 & 3 & 6 \\ & 8 & 7 & 9 & 7 \\ & +2 & +3 & +1 & +6 \\ \cline{2-5} \\ \textbf{3.} & 4 & 3 & 5 & 2 \\ & 5 & 6 & 7 & 9 \\ & 4 & 7 & 9 & 8 \\ & +5 & +4 & +3 & +2 \\ \cline{2-5} \\ \textbf{4.} & 5 & 4 & 1 & 9 \\ & 5 & 7 & 4 & 1 \\ & 3 & 5 & 2 & 3 \\ & +6 & +3 & +8 & +9 \\ \cline{2-5} \end{array}$$

Another way In a column addition you can first add the numbers with a sum of ten, such as 6 and 4, 8 and 2. Then you can add the sums of the other numbers to the 10.

$$\begin{array}{rlr} 8 & \text{Add:} & 8+2=10 \\ 3 & & 3+4=7 \\ 4 & & 10+7=17 \\ +2 & & \\ \cline{1-1} \\ 5 & \text{Add:} & 6+4=10 \\ 6 & & 5+3=8 \\ 4 & & 10+8=18 \\ +3 & & \\ \cline{1-1} \end{array}$$

Check the additions in row 3 using the way suggested above.

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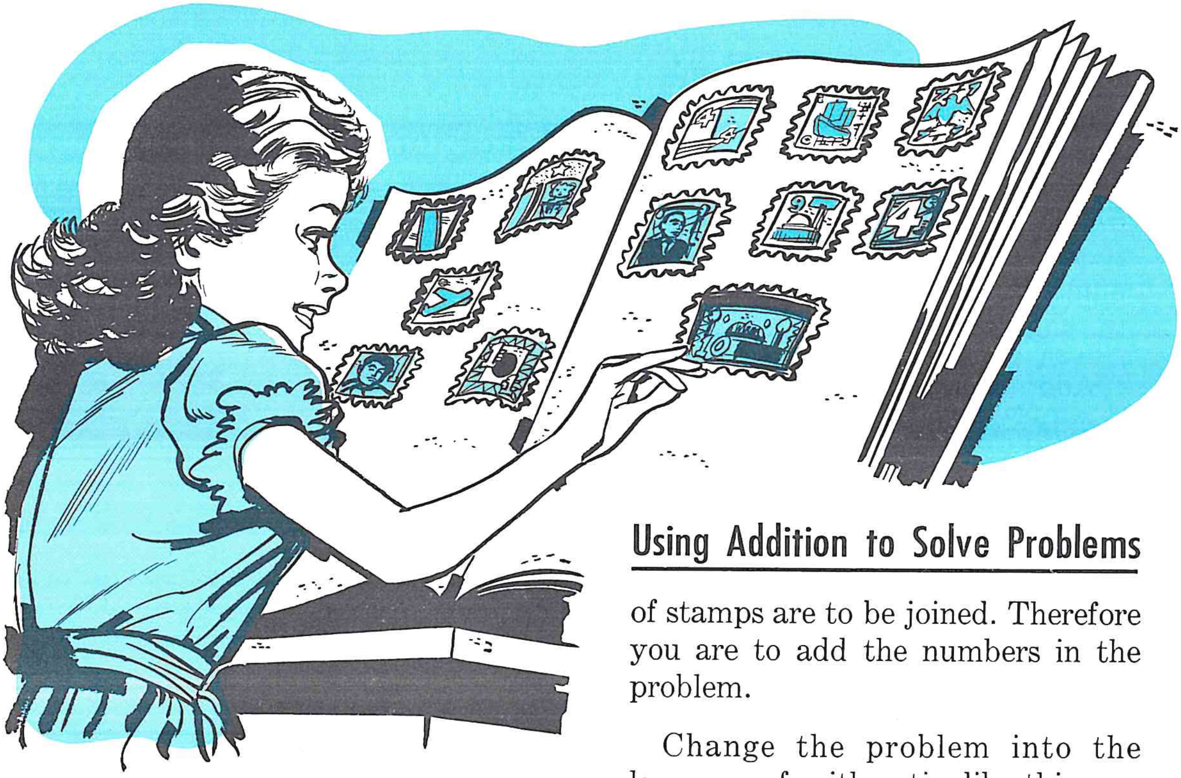
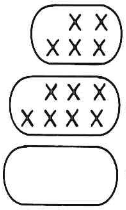
Using Addition to Solve Problems



Jane had 5 stamps. Her uncle gave her 7 stamps. How many stamps did she have altogether?

The above problem tells a story. Then it asks a question which can be answered by doing something with the numbers in the story. Here is the story problem in pictures.



= 5 Stamps Jane had

= 7 Stamps Jane received

= n All stamps together

The question in the above problem tells you that the two groups, or sets, of stamps are to be joined. Therefore you are to add the numbers in the problem.

Change the problem into the language of arithmetic, like this:

a. Use 5 to stand for 5 stamps.

b. Use 7 to stand for 7 stamps.

c. Use + to stand for the idea that the sets are to be thought of as being together.

d. Use n to stand for the number that is missing.

e. Write the statement 5+7=n.

In column form the arithmetic statement is written as shown. Add to find that Jane had 12 stamps.

$$\begin{array}{r}5\\+7\\\hline\end{array}$$

Oral Read the 3 problems below. Be ready to tell what you should do with the numbers in each problem.

1. The boys had two teams for the beanbag game, the Yanks and the Cubs. The Yanks had 7 players and the Cubs had 7 players. How many players were there on the two teams together?

2. The girls called their teams the Robins and the Blue Jays. The Robins had 5 players and the Blue Jays had 6 players. How many girls were on the two teams together?

3. Paul's score was 2 on his first throw and 3 on his second throw. What was his total score for the two throws?

Written Follow these directions.

1. Write the arithmetic statement for problem 1 above. Find the value of n.

2. Write the statement for problem 2. Find the value of n.

3. Write the statement for problem 3. Find the value of n.

Solve the following problems.

4. Janet put 7 pennies into a bank which already had 89 pennies in it. How many pennies were then in her bank?

5. Jack has 94 pennies. Robert has 9 pennies. How many pennies do the boys have together?

6. A group of 36 boys were playing ball. Another group of 5 boys joined them. How many boys were then in the single larger group?

7. Roger has read 99 pages in a book. He has 6 more pages to read. How long is his book?

8. June mailed 3 cards the first day of her vacation, 0 the second day, and 4 the third. How many cards did she mail in the 3 days?

Make story problems from the following arithmetic statements.

	a	*b*
9.	$7+5=n$	$6+9=n$
10.	$9+7=n$	$8+6=n$

A quick review

	a	*b*
1.	$3+7=n$	$23+7=n$
2.	$8+n=13$	$18+5=n$
3.	$9+7=n$	$29+7=n$
4.	$8+6=n$	$18+6=n$
5.	$n+8=15$	$17+8=n$
6.	$2+9=n$	$22+9=n$
7.	$5+n=14$	$n+9=14$

Changing Ones to Tens and Tens to Hundreds

Robert had 97 shells in his collection. His aunt gave him 6 more shells. How many shells did Robert then have?

The shells are to be joined together, and so you are to add the numbers. The arithmetic statement for the problem is 97+6=n. One way to find the sum is to write the statement in column form as shown in grid A.

A

$$\begin{array}{r|r|r} & \text{T} & \text{O} \\ & {\scriptstyle 1} & \\ & 9 & 7 \\ & + & 6 \\ \hline 1 & 0 & 3 \end{array}$$

Add this way:

Ones: 7 ones + 6 ones = 13 ones. Change the form of 13 ones to 1 ten and 3 ones. Write 3 ones. Remember 1 ten.

Tens: 1 ten remembered+9 tens=10 tens. Change the form of 10 tens to 1 hundred and 0 tens. Write 1 hundred and 0 tens. The sum is 1 hundred, 0 tens, and 3 ones, or 103.

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To add 3 or more addends, as in 5+3+4+98=n, follow steps similar to those above. Look at grid B. What changes were made in the form of the ones and the tens?

B

$$\begin{array}{r|r|r} \text{H} & \text{T} & \text{O} \\ & {\scriptstyle 2} & \\ & & 5 \\ & & 3 \\ & & 4 \\ + & 9 & 8 \\ \hline 1 & 1 & 0 \end{array}$$

Oral Be ready to tell the steps you would take in finding the sum for each addition in column form.

	a	*b*	*c*	*d*
1.	96 +6	8 +99	92 +9	7 +98
2.	4 95 +9	94 8 +2	8 96 +7	9 9 +89

Written Follow these directions.

1. Copy row 1 above. Find each sum. Check.

2. Copy row 2 above. Find each sum. Check.

Copy. Find each sum. Check.

	a	*b*	*c*	*d*
3.	98 +8	99 +9	8 +96	96 +6
4.	85 7 +8	3 2 +97	8 3 +89	95 7 +4
5.	72 9 7 +1	8 17 6 +9	67 0 5 +1	70 3 2 +7

Another way Think of the statement 97+6=n as 97+(3+3)=n. This becomes (97+3)+3=n, or 100+3=n, or 103. Check the additions in row 3 above using this way.

Adding Two-Digit Numbers

You have been adding to find the sum in such statements as 48+6=n. You added the ones. Then you added 1 ten remembered to the tens. You were using steps that you can use in adding 2-digit numbers as 35+30=n. Look at grid A. To find the sum, add the ones. Then add the tens. The sum is 65.

A

	T	O
	3	5
+	3	0
	6	5

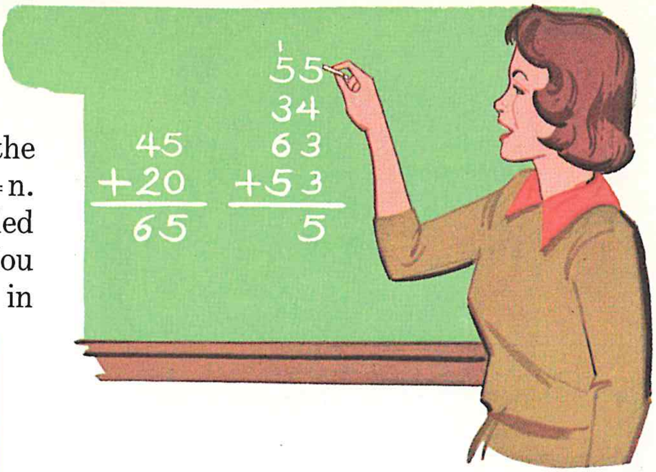
To find the sum of such statements as 54+44+35+63=n, you can follow the steps shown in B. Begin by adding the ones. Then add the tens. The sum is 1 hundred, 9 tens, and 6 ones, or 196.

B

	H	T	O
		1	
		5	4
		4	4
		3	5
+		6	3
	1	9	6

Oral Be ready to tell the steps you would take in finding the sum for each addition below.

	a	*b*	*c*	*d*
1.	68 +10	22 +43	15 +24	53 +35
2.	19 30 +50	52 15 +20	43 22 +32	20 12 +37



Written Follow these directions.

1. Copy row 1 in the oral practice. Find each sum. Check.

2. Copy row 2 in the oral practice. Find each sum. Check.

Copy. Find each sum. Check.

	a	*b*	*c*	*d*
3.	35 +52	54 +45	20 +36	14 +83
4.	65 +84	90 +55	42 +97	96 +60
5.	23 +85	62 +51	87 +40	96 +72
6.	40 92 +81	64 20 +33	70 35 +40	52 73 +81
7.	13 10 29 +15	25 14 29 +30	24 26 13 +19	18 25 23 +15

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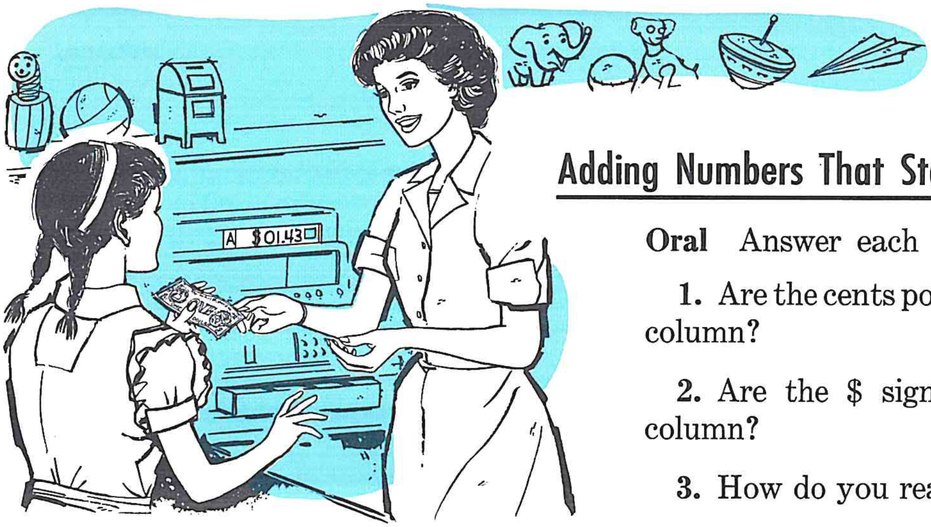
Adding Numbers That Stand for Money



Ann spent $.39 for a game, $.75 for a doll, and $.29 for a coloring book. How much did she spend in all?

Study the addition in column form below. Do you see that the dollar sign is written at the left of the first addend and of the answer, or sum? The cents point is written at the left of every addend and between the dollars and the cents in the sum as shown.

$$\begin{array}{r} \$\ \overset{2}{.3}9 \\ .75 \\ +.29 \\ \hline \$1.43 \end{array}$$

First add the cents. The sum is 23 cents. Change the form of 23 cents to 2 dimes and 3 cents. Write 3 cents, as in the example. Remember the 2 dimes. Add them to the other dimes. The sum is 14 dimes. Change the form of 14 dimes to 1 dollar and 4 dimes. Write as shown in the example.

Oral Answer each question below.

1. Are the cents points in a straight column?

2. Are the $ signs in a straight column?

3. How do you read the sum?

Written Copy. Find each sum. Change cents to dimes, and change dimes to dollars when you have to. A convenient way to find each sum is to add down. Then, to check your work, add in another way.

	a	*b*	*c*	*d*
1.	$.50 .37 +.26	$.08 .60 +.07	$.43 +.29	$.97 .25 +.35
2.	$.39 .10 +.47	$.50 +.49	$.69 +.48	$.19 .98 +.25
3.	$.45 .27 +.15	$.78 .79 +.47	$.69 .95 +.39	$.06 .87 +.43
4.	$.08 .61 +.24	$.27 .32 +.18	$.21 .72 +.03	$.63 .10 +.37
5.	$.83 .07 +.15	$.09 .92 +.06	$.13 .29 +.52	$.40 .37 +.66

Adding Two-Digit and Three-Digit Numbers

Sally and her father drove 356 miles on Saturday and 85 miles on Sunday. How far did they drive on both days?

The problem tells you that you are to think of the miles together, and so you are to add. As an arithmetic statement, the problem may be written 356+85=n. To find the sum you can follow the steps in grid A.

A

H	T	O
1	1	
3	5	6
+	8	5
4	4	1

Ones: Add. Change the form of 11 ones to 1 ten and 1 one. Write 1 one as in A.

Tens: Add. Change the form of 14 tens to 1 hundred and 4 tens. Write 4 tens.

Hundreds: Add. Write 4 hundreds. The sum is 441.

Do you see that 4 hundreds, 4 tens, and 1 one are all parts of the sum? We can call each a **partial sum.**

B

Th	H	T	O
	9	8	8
	+	9	9
1	0	8	7

In additions, such as 988+99=n, the sum of the hundreds is 10 hundreds or more. Then you change the form of the hundreds as shown in B. By this time you should no longer need the little reminder numerals. Add the digits in each place-value position and make needed changes in the form of the numbers before you write each partial sum. The sum is 1087.

Oral Be ready to tell the steps you would take in finding the sum for each addition in column form.

	a	*b*	*c*	*d*
1.	314 +32	894 +35	658 +89	979 +87
2.	532 41 +15	761 23 +42	425 71 +89	992 89 +76

Written Follow these directions.

1. Copy row 1 above. Find each sum. Check by adding another way.

2. Copy row 2. Find each sum. Check.

Copy. Find each sum. Check.

	a	*b*	*c*	*d*
3.	937 +81	960 +81	948 +97	972 +28
4.	100 37 +10	79 86 +289	858 89 +79	53 21 +978

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Adding Three-Digit Numbers

Jane and her mother took a trip by airplane. They flew 824 miles. Coming home they traveled 465 miles by train. How many miles did they travel in all? The 824 miles and 465 miles must be thought of as being together. Therefore we add as in A below.

Study the example to help you solve the problem. You see that both of the addends for the problem are three-digit numbers. To find the sum you add the ones, add the tens, and add the hundreds. Jane and her mother flew 1289 miles.

A

Th	H	T	O
	8	2	4
+	4	6	5
1	2	8	9

You add hundreds in the same way that you add tens and ones. You change the form of the numbers in any partial sum if the partial sum is 10 or more. The length of the trip was 1289 miles.

When you add money numbers, be sure to write the dollar signs and cents points in the correct places, as shown in B.

B

$1.29
2.50
+1.49
$5.28

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Oral Be ready to tell the steps you would take in finding the sum for each addition in column form below.

a	*b*	*c*	*d*
845 +130	181 +424	743 +616	$8.52 7.93

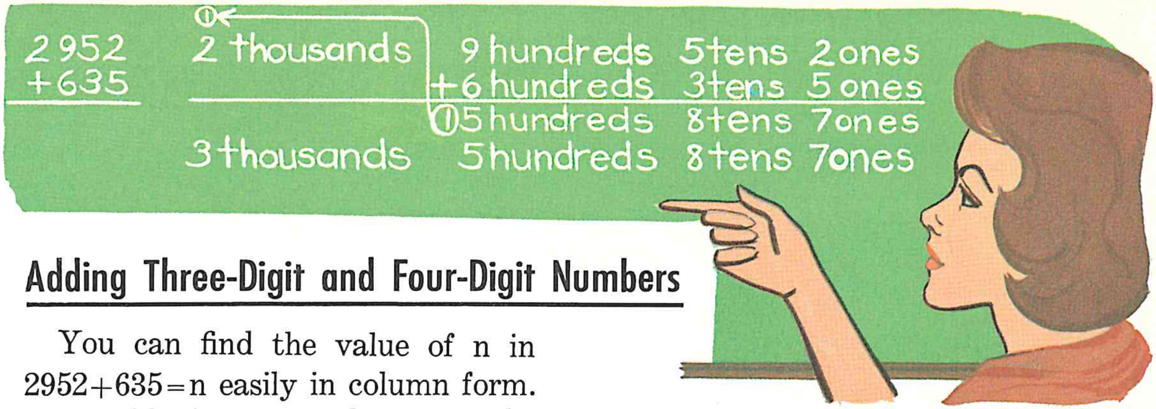
Written Follow these directions.

1. Copy the row in oral practice above. Find each sum. Check.

Copy the additions in column form below and check by adding another way.

Remember: Change the form of 10 ones to 1 ten, 10 tens to 1 hundred, and 10 hundreds to 1 thousand when you need to do so.

	a	*b*	*c*	*d*
2.	359 +506	568 +917	236 +698	$7.68 +2.65
3.	876 +469	659 +564	947 +683	$7.82 +2.18
4.	293 134 +230	217 308 +439	500 196 +127	$8.60 1.79 +3.07
5.	600 825 760 +403	541 700 253 +392	705 219 321 +648	$3.50 4.07 1.89 +6.80


2952
+635
①
2 thousands
9 hundreds 5 tens 2 ones
+6 hundreds 3 tens 5 ones
①5 hundreds 8 tens 7 ones
3 thousands 5 hundreds 8 tens 7 ones

Adding Three-Digit and Four-Digit Numbers

You can find the value of n in 2952+635=n easily in column form. Just add the ones, the tens, the hundreds, and the thousands separately. Make changes in form when you need to.

Sometimes you have a sum of more than 9 thousands. Then you must change the form of the thousands to ten thousands as shown in grid A. In the grid, TTh stands for ten thousands. The sum of thousands was 10. The form of the thousands was changed to 1 ten-thousand. The sum is ten thousand, one hundred thirty-one.

A

TTh	Th	H	T	O
	9	3	8	6
	+	7	4	5
1	0	1	3	1

Example B shows an addition of money numbers. The addition was done as it was in example A. Notice that the dollar signs and the cents points are in straight columns.

B

$ 93.86
+7.45
$101.31

Oral Be ready to tell the steps you would take in finding the sum for each addition in column form below.

	a	*b*	*c*
1.	415 +2905	9584 +464	$60.23 +5.07
2.	339 +5881	9257 +973	$13.79 +2.86

Written Follow these directions.

1. Copy row 1 above. Find each sum. Check.

2. Copy row 2. Find each sum. Check.

Copy. Find each sum. Check by adding in another way.

	a	*b*	*c*
3.	654 792 +6983	9860 920 +759	$43.62 .51 +3.95
4.	$67.25 4.69 +1.85	$ 3.98 42.65 +37.60	$75.86 32.50 +7.98

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Adding Four-Digit Numbers

Study the addition below. Tell how the addition is done. Notice that the form of 10 thousands was changed to 1 ten-thousand. The sum, eleven thousand twenty-three, may be written 11,023. The comma after thousands makes the numeral easier to read.

$$\begin{array}{r} 9768 \\ +1255 \\ \hline 11023 \end{array}$$

Oral Be ready to tell the steps you would take in finding each sum below.

a	*b*	*c*
8700 +1056	2624 +4765	$67.64 +91.05

Written Follow these directions.

1. Copy the column additions above. Find each sum. Check.

Copy. Find each sum. Check by adding another way.

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	a	*b*	*c*
2.	3456 +7831	4597 +6601	$72.62 +24.86
3.	2080 +8020	6541 +3876	$47.62 +19.53
4.	1479 2308 +1300	7353 1619 +5012	$51.25 73.49 +17.01
5.	3028 2043 604 +1800	2165 3210 1050 +1325	$70.15 49.20 23.19 +38.72
6.	5240 1307 2065 +4000	3537 2150 4002 +6041	$14.25 10.50 15.75 +19.00

Solve these problems.

7. John's father kept a record of how far he drove each month. He drove 1419 miles in September, 1115 miles in October, and 1928 miles in November. How far did he drive in all 3 months?

8. Betty spent $2.79 for a book, $.39 for a notebook, and $.15 for paper. How much money did she spend?

9. A traffic count showed that on Sunday 4895 cars passed the counting machine. On Monday 7568 cars passed the machine, on Tuesday 7219 passed it, and on Wednesday 6301 passed it. How many cars passed the counting machine in these 4 days?

10. Sally's new coat cost $19.98. Her dress cost $8.75, and new shoes cost $11.50. How much did her new clothes cost?

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. When you are to think of groups, or sets, as being joined, add the numbers of the sets. (17)

2. In addition, the numbers you add are called addends. (17)

3. The number of the group, or set, you get by adding is called the sum. (17)

4. You add ones to ones, tens to tens, hundreds to hundreds, thousands to thousands, and ten-thousands to ten-thousands. (20, 24, 25, 27, 28, 29, 30)

Words to Know

1. Addend and sum (17)

2. Partial sum (27)

Questions to Discuss

1. How can you find the sum of an addition such as 8+7 if you forget it? (18, 19)

2. How can you decide that you should add the numbers in a problem in order to solve it? (17, 22)

3. How is the addition of 3 or more addends different from the addition of 2 addends? (21)

Written Practice

Copy in column form. Write each sum.

	a	*b*	
1.	5+3=n	2+4=n	(18)
2.	9+7=n	6+9=n	(19)
3.	33+4=n	5+94=n	(20)
4.	57+8=n	6+58=n	(20)
5.	66+7=n	7+57=n	(20)

Copy. Write each sum.

	a	*b*	*c*	
6.	37 25 +46	74 17 +19	45 20 +14	(25)
7.	\$.85 .23 +.35	\$.50 .37 +.11	\$.95 .89 +.68	(26)
8.	214 +533	878 +129	375 +250	(28)
9.	896 475 +315	252 426 +135	315 219 +985	(29)
10.	7052 431 +235	8198 2156 +1432	9292 4675 +4386	(30)

Self-Evaluation

Part 1 Copy. Write each sum.

	a	*b*	*c*	*d*
1.	9 +8	2 +6	8 +8	7 +5
2.	9 8 +7	6 0 +9	5 4 +8	8 9 +5
3.	7 6 5 +4	4 3 9 +5	9 9 0 +9	7 6 9 +5
4.	33 +5	42 +6	87 +9	97 +6
5.	54 +20	34 +25	67 +29	89 +98
6.	41 32 +15	27 31 +20	94 31 +22	87 95 +64
7.	52 35 46 +85	91 85 76 +92	82 28 35 +75	73 28 37 +82

Part 2 Copy. Write each sum.

	a	*b*	*c*	*d*
1.	214 +23	115 +84	367 +72	485 +33
2.	329 +134	455 +236	853 +339	829 +283
3.	565 132 +224	676 133 +128	89 928 +854	197 936 +898
4.	875 462 321 +36	158 242 375 +461	237 195 672 +432	819 728 530 +906

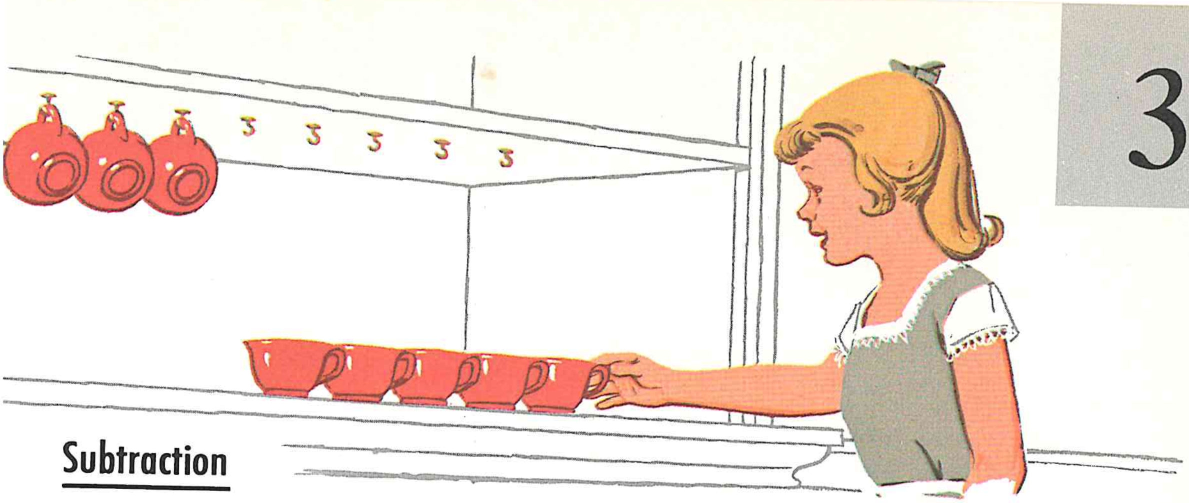
Part 3 Copy. Write each sum.

	a	*b*	*c*
1.	3146 +213	5875 +264	9956 +395
2.	4152 1310 +2025	4189 3198 +2561	5987 4968 +3875
3.	5146 2958 3612 +4319	2875 3875 9950 +8750	$49.50 37.45 27.98 +48.98

Part 4 Solve these problems.

1. The fourth grade collected 168 pounds of paper for the paper drive, the fifth grade 150 pounds, and the sixth grade 268 pounds. How many pounds of paper did the three grades collect?

2. In one month Mr. Evans paid $27.34 for gasoline, $.65 for oil, and $2.75 for parking his car. How much did he pay in all?



3

Subtraction

The statements below will help you see how subtraction is related to addition.

Begin with..........	3
Add it to...........	+5
You have...........	8
Then begin with.....	8
Subtract from it.....	−5
You have...........	3

In the subtraction statement 8−5=3, 8 is the **minuend.** It is exactly the same as the sum of the addition 3+5=8. In subtraction, the number 5, which is subtracted, is the **subtrahend.** It is the same as the addend 5.

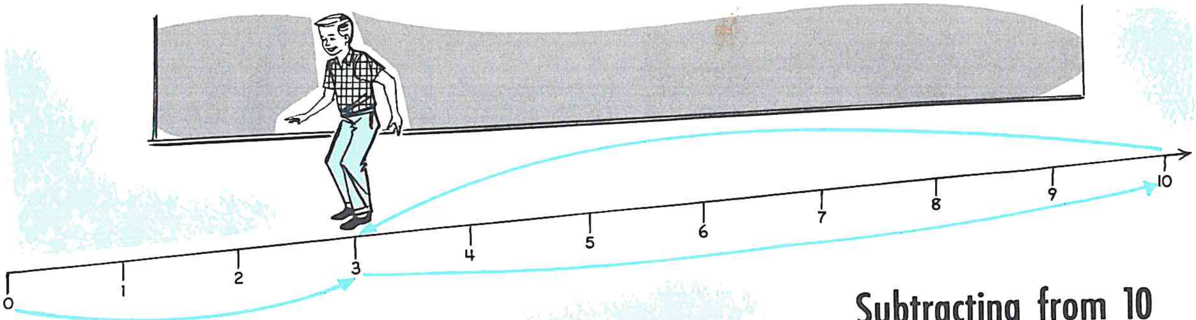
The number 3 in the subtraction tells *by how many* 8 is different from 5. Therefore it is called the **difference.** The difference is the same as the addend 3.

Oral Find the value of n in each equation below. Be ready to tell the minuend, the subtrahend, and the difference in each equation in column *b.*

	a	*b*
1.	$4+n=9$	$9-5=n$
2.	$3+n=8$	$8-5=n$
3.	$n+4=7$	$7-4=n$
4.	$5+n=9$	$9-4=n$
5.	$n+7=9$	$9-7=n$

Now find the value of n in these equations.

	a	*b*
6.	$4+n=7$	$n=7-4$
7.	$6+n=9$	$n=9-6$
8.	$6+n=8$	$n=8-6$
9.	$3+n=9$	$n=9-3$
10.	$2+n=8$	$n=8-2$



Subtracting from 10

Bob showed how to add 3 and 7 by starting at 0 and walking to 3, passing the first 3 spaces on the way. He walked in the same direction, passing the next 7 spaces, and stopped at 10. He then showed the meaning of $10-7$ by reversing his direction and walking toward 0. He took 7 steps in this direction, stopping at 3. Did you see the meaning of $3+7=10$ on the number line? Did you see the meaning of $10-7=3$ on the number line?

Oral Complete each statement in *b* below. Use the number line for help if you need it.

	a	*b*
1.	$9+1=10$	$10-1=n$
2.	$8+2=10$	$10-2=n$
3.	$6+4=10$	$10-4=n$
4.	$7+3=10$	$10-3=n$
5.	$2+8=10$	$10-8=n$
6.	$1+9=10$	$10-n=1$
7.	$3+7=10$	$10-7=n$
8.	$5+5=10$	$10-5=n$
9.	$4+6=10$	$10-6=n$

Written Copy. Write each difference. Check each subtraction by adding the difference to the subtrahend.

	a	*b*	*c*	*d*
1.	9 −7	6 −4	8 −3	7 −5
2.	5 −3	9 −6	8 −2	7 −3
3.	8 −6	10 −1	6 −3	10 −4
4.	10 −8	10 −7	8 −8	10 −9
5.	10 −7	10 −3	9 −4	10 −6
6.	10 −2	10 −9	9 −9	10 −5

Something to do Make practice cards for the subtractions from 10. Use them to help you learn each one.

Subtracting from 11, 12, and 13

You can always use addition to help you find the difference in a subtraction equation. You know that $9+2=11$; so $11-2=9$.

Oral Read each equation below, replacing n with the correct number word.

	a	*b*
1.	$9+2=n$	$11-2=n$
2.	$8+3=n$	$11-3=n$
3.	$7+4=n$	$11-4=n$
4.	$6+5=n$	$11-5=n$
5.	$5+6=n$	$11-6=n$
6.	$4+7=n$	$11-7=n$
7.	$3+8=n$	$11-8=n$
8.	$2+9=n$	$11-9=n$
9.	$9+3=n$	$12-3=n$
10.	$3+9=n$	$12-9=n$
11.	$8+4=n$	$12-4=n$
12.	$4+8=n$	$12-8=n$
13.	$7+5=n$	$12-5=n$
14.	$5+7=n$	$12-7=n$
15.	$6+6=n$	$12-6=n$
16.	$9+4=n$	$13-4=n$
17.	$4+9=n$	$13-9=n$
18.	$8+5=n$	$13-5=n$
19.	$5+8=n$	$13-8=n$
20.	$6+7=n$	$13-7=n$

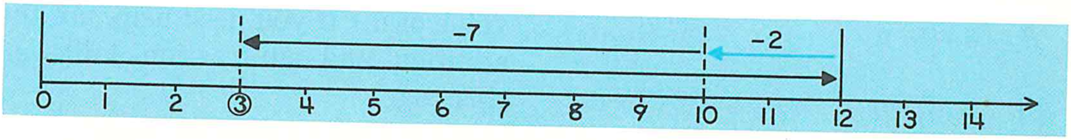
Written Write each equation in rows 1 through 20 in column form. Supply the missing numeral.

Another way Try doing subtraction in more than one step. $12-9=n$ can be done on the number line in two steps as shown below.

First do: $12-2=10$
As step 2, do: $10-7=3$

The steps can be shown like this:
$12-9=n$ becomes $(12-2)-7=n$
This becomes $10-7=n$
Then $3=n$

Try using this way in doing the subtractions in rows 1 through 20.



Subtracting from 14, 15, 16, 17, and 18

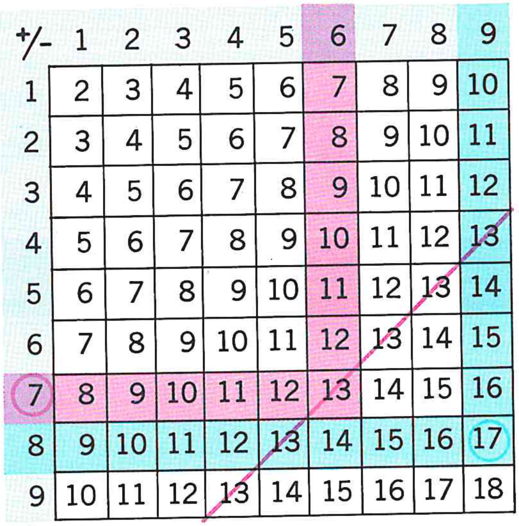
The table on this page can be used to find any addition or subtraction combination through 18. To find the value of n in the equation $8+9=n$, find 8 in the left column and 9 in the top row. The sum, 17, is in the square where the 8 row across and the 9 column down cross, or **intersect.**

To find n in the equation $13-6=n$, find the slanted, or **diagonal,** row of 13's on the table. You pick the 13 which is underneath the subtrahend, 6, in the top row. The difference, 7, is in the left column across from the 13 you chose.

Oral Be ready to read each equation below, replacing n with a number word.

	a	*b*
1.	$9+5=n$	$14-5=n$
2.	$5+9=n$	$14-9=n$
3.	$6+8=n$	$14-8=n$
4.	$8+6=n$	$14-6=n$
5.	$7+7=n$	$14-7=n$
6.	$9+6=n$	$15-6=n$
7.	$6+9=n$	$15-9=n$
8.	$8+7=n$	$15-7=n$

MORE PRACTICE PAGE 300



+/-	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
⑦	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	(17)
9	10	11	12	13	14	15	16	17	18

	a	*b*
9.	$7+8=n$	$15-8=n$
10.	$9+7=n$	$16-7=n$
11.	$7+9=n$	$16-9=n$
12.	$9+8=n$	$17-8=n$
13.	$8+9=n$	$17-9=n$
14.	$9+9=n$	$18-9=n$

Written Write each equation in rows 1 through 14 in column form. Solve the addition and then the subtraction equation in each row. (You solve an equation by finding the value of n.) If you need help, use the addition and subtraction table on this page.

A Zero in Subtraction

Eugene had 5 marbles. He lost all 5 of them. How many marbles did he have left?

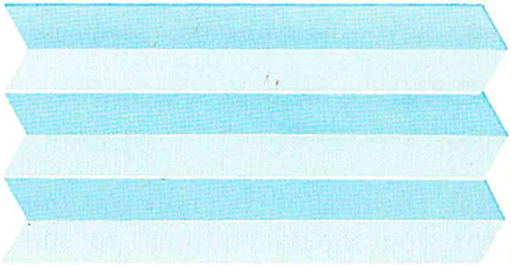
The equation for the problem is $5-5=n$. The value of n is 0 because no marbles are left.

Whenever the minuend and the subtrahend are the same, the difference between them is 0.

Some of the subtraction combinations are given below. Read each one, supplying the difference.

	a	*b*	*c*	*d*	*e*
1.	2 −1	6 −6	4 −3	6 −2	8 −2
2.	9 −4	3 −2	5 −5	8 −8	7 −6
3.	8 −5	9 −7	6 −4	7 −7	6 −5
4.	5 −2	7 −4	9 −8	6 −4	4 −4
5.	6 −1	8 −3	5 −4	8 −4	8 −6
6.	9 −2	8 −1	9 −5	4 −1	7 −5
7.	5 −3	9 −6	9 −9	14 −8	13 −6
8.	11 −2	12 −3	10 −5	14 −5	10 −6
9.	13 −4	11 −9	12 −4	13 −5	11 −3
10.	15 −6	14 −6	10 −1	15 −7	12 −7
11.	16 −8	14 −7	11 −7	10 −7	10 −8
12.	15 −8	12 −6	13 −9	12 −8	11 −6
13.	15 −9	10 −9	11 −8	13 −8	10 −2
14.	16 −7	16 −9	17 −8	14 −9	11 −5
15.	10 −3	18 −9	13 −7	17 −9	12 −9

Written Fold a piece of paper as shown. Lay the top of your paper under row 1. Write each difference. Fold your answers under. Write row 2. Continue through row 15.

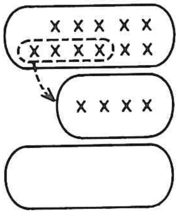


Finding How Many Left

Doris had 11 pieces of candy. She ate 4 of the pieces. How many pieces of candy were left?

This problem tells you that a set of 11 was taken apart. Therefore you subtract the numbers of the sets.

Here is the story in pictures.



11 All of the candy

4 The pieces eaten

n The pieces left

After you decide that you are to subtract, change the problem into the language of arithmetic, like this:

a. Use 11 to stand for the number of all of the candy.

b. Use 4 to stand for the number of pieces of candy which were eaten.

c. Use – to stand for subtract.

d. Use n to stand for the number that is missing.

e. Write the equation $11 - 4 = n$.

Replace n with 7. The answer is 7 pieces of candy.

Oral Be ready to tell how you know that you should subtract to solve each problem below. Tell what equation you would use.

1. There are 15 children on the playground. If 9 of them go home, how many will be left?

2. Wilma found 16 sea shells. She gave 7 of them to Mary. How many shells did she have left?

Written Follow these directions.

1. Write the equation for problem 1 above. Solve the equation.

2. Write the equation for problem 2 above. Solve the equation.

Solve each problem below. Begin by changing it into an equation.

3. Howard had 17 marbles. He lost 8 of them from his pocket. How many marbles did he have left?

4. Julie had 12 pencils. She has used up 3 of the pencils. How many pencils are left?

Something to do Make up your own story problems, which can be solved by finding how many left. The equations below tell you the numbers to use.

	a	*b*
1.	$13 - 7 = n$	$12 - 6 = n$
2.	$15 - 8 = n$	$17 - 9 = n$

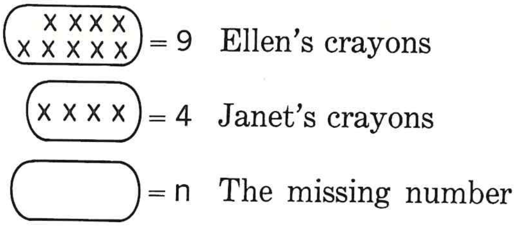
Finding How Many More or Less

Read the story problem that follows. Find what story is told. Pay special attention to the question.

Ellen had 9 crayons on her desk and Janet had 4 crayons on hers. How many more crayons were on Ellen's desk than on Janet's?

To solve the problem, you must do something with the numbers in it. In the problem about Ellen and Janet you are to compare, or match, the two sets of crayons. Match four crayons of Janet's, one to one, with 4 of Ellen's.

Now you can see how the sets differ in number. Comparing two numbers to find the difference between them is subtracting. You can solve the problem by subtracting the numbers in it.



After you decide that you are to subtract, change the problem into the language of arithmetic.

a. Use 9 to stand for Ellen's crayons.

b. Use 4 to stand for Janet's crayons.

c. Use − to stand for subtract.

d. Use n to stand for the missing number.

e. Write the equation $9-4=n$. Replace n with the missing numeral. 5 tells the difference between 9 and 4. The answer is 5 crayons.

Oral Be ready to tell how you know that you should subtract in each problem below. Tell which equation you would use in solving each one.

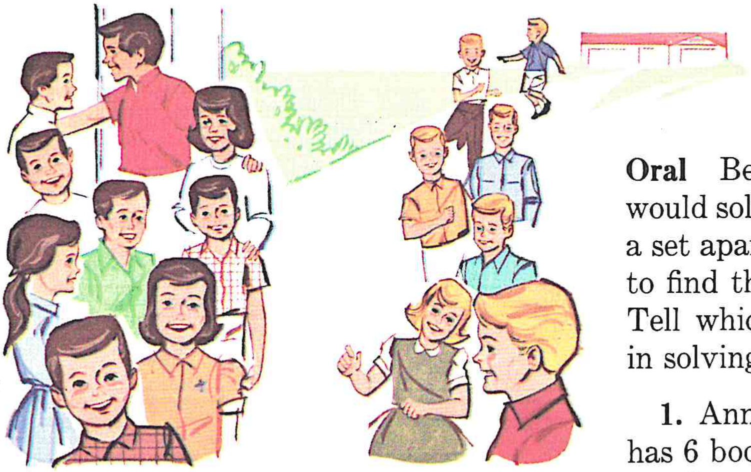
1. Bob had 8 marbles and Dick had 3 marbles. How many fewer marbles had Dick than Bob?

2. Caroline had 7 pennies. Sally had 5. How many more pennies did Caroline have than Sally?

3. Peter had 18 pictures of baseball players. Steve had 11. How many fewer pictures did Steve have than Peter?

Written Solve problems 1, 2, and 3 above.

Something to do Write five story problems which can be solved by finding how many more or how many less of something one person has than another. Write an equation for each problem and then solve it.



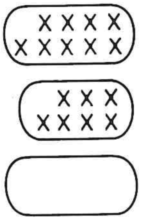
Finding the Difference

Read this problem. Find out what story is told and pay special attention to the question.

There are 9 children in the Larsen family and 7 children in the Smith family. What is the difference between the numbers that tell how many children are in each family?

The question asks you to compare two numbers to find how many more in one set than in the other. Comparing two numbers to find the difference between them is subtracting.

The problem can be shown like this:



= 9 Larsen family

= 7 Smith family

= n The missing number

The equation is 9 − 7 = n. The missing number, n, is 2.

Oral Be ready to tell whether you would solve these problems by taking a set apart or by comparing two sets to find the difference between them. Tell which equation you would use in solving each problem.

1. Ann has 14 books and Susan has 6 books. How many fewer books has Susan than Ann?

2. Dale had 9 pennies. He spent 6 of the pennies. How many pennies were left?

3. John is 11 and his sister is 6. What is the difference between their ages?

4. Ronald has 13 cherries and Bob has 9. How many more cherries has Ronald than Bob?

5. Alice had 7 goldfish. She gave the goldfish away. How many goldfish did she have left?

Written Solve problems 1 through 5 above.

Something to do Make up your own story problems. The equations below tell you the numbers to use.

	a	*b*
1.	11 − 7 = n	16 − 7 = n
2.	13 − 6 = n	15 − 8 = n

Subtracting One-Digit from Two-Digit Numbers

Martin had 36¢ and spent 4¢ for a pencil. How much money did he have left?

You are to take a set apart; so you subtract the numbers. The equation is 36 − 4 = n: You may be able to think 36 − 4 = 32. Or you can write the equation in column form as in A. You can subtract like this:

A

$$\begin{array}{r|l} 3 & 6 \text{ minuend} \\ - & 4 \text{ subtrahend} \\ \hline 3 & 2 \text{ difference} \end{array}$$

Ones: 6 ones − 4 ones = 2 ones. Write 2 ones.

Tens: There are no tens to be subtracted from 3 tens; so write 3 tens.

Martin had 32¢ left.

To find n in the equation 22 − 7 = n, you might think 22 − 7 = 15. Or you might subtract as shown in grid B.

B

$$\begin{array}{c|c} T & O \\ \overset{1}{\cancel{2}} & \overset{12}{\cancel{2}} \\ - & 7 \\ \hline 1 & 5 \end{array}$$

Ones: You cannot subtract 7 ones from 2 ones, for 7 is more than 2. Change the form of 1 ten to 10 ones. Add the 10 ones to the 2 ones. Then there are 12 ones in the minuend. 12 − 7 = 5. Write 5 ones.

Tens: Write the 1 ten that is left.

The difference is 15. 22 − 7 = 15.

Oral Read each equation below, replacing n with the missing number word.

	a	*b*
1.	55 − 5 = n	27 − 4 = n
2.	98 − 9 = n	73 − 7 = n
3.	61 − 8 = n	44 − 6 = n
4.	17 − 9 = n	32 − 3 = n
5.	n − 9 = 14	13 − n = 5

Written Copy and find each difference. Check by using addition.

	a	*b*	*c*	*d*
1.	98 −6	69 −6	48 −3	57 −4
2.	85 −3	36 −6	79 −8	27 −3
3.	64 −8	50 −7	21 −9	46 −8
4.	35 −6	90 −9	73 −6	81 −7
5.	13 −8	81 −9	52 −7	96 −8
6.	56 −7	87 −9	72 −6	18 −9

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Subtracting Two-Digit Numbers

A

$$\begin{array}{r|l} \text{T} & \text{O} \\ 6 & 9 \\ -3 & 5 \\ \hline 3 & 4 \end{array}$$

B

$$\begin{array}{r|l} \text{T} & \text{O} \\ 5 & 10 \\ \cancel{6} & \cancel{0} \\ -4 & 6 \\ \hline 1 & 4 \end{array}$$

Study the subtraction in A. Notice that there are more ones in the minuend than in the subtrahend. To find the difference, 34, subtract the ones and then the tens.

Now study the subtraction in B. There are more ones in the subtrahend than in the minuend. You must change the form of the minuend as shown by the reminder numerals in B. Then you can subtract. The difference is 14.

Oral Be ready to tell the steps you would take in finding the difference in each of the following subtractions.

	a	*b*	*c*	*d*
1.	98 −43	73 −61	93 −35	80 −48
2.	36 −24	72 −68	81 −72	98 −88

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Written Follow these directions.

1. Copy row 1 above. Write each difference. Check.

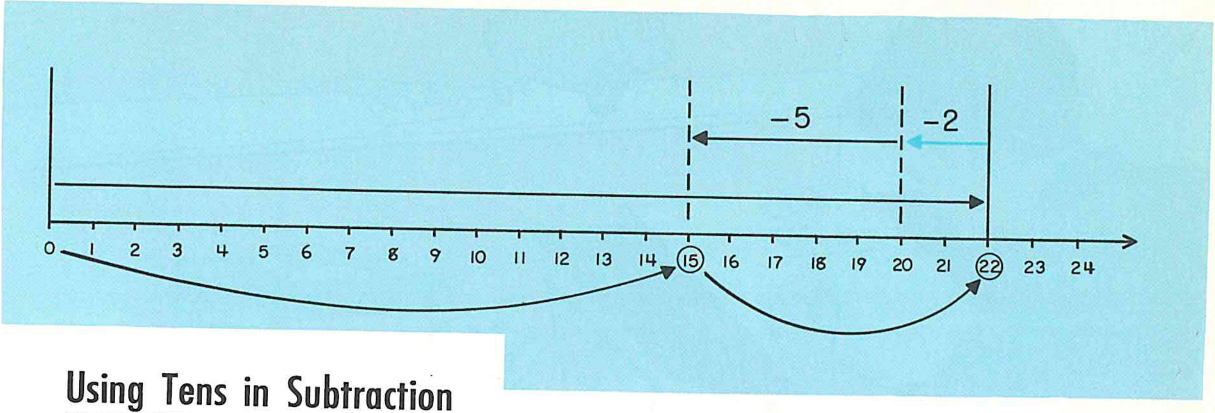
2. Copy row 2 of the oral practice. Write each difference. Check.

Copy each subtraction below and find the difference. Check by using addition.

	a	*b*	*c*	*d*
3.	85 −54	56 −36	47 −13	79 −30
4.	99 −51	84 −22	94 −39	52 −19
5.	35 −17	65 −28	74 −36	83 −57
6.	52 −49	57 −54	65 −56	26 −17
7.	98 −89	42 −35	72 −35	67 −34
8.	63 −27	49 −15	45 −19	55 −21

Another way Look at the equation $81-19=n$. Think: 19 is almost 20. I will subtract 20 and then add 1: $81-20=61$, and $61+1=62$. How might you find n in these equations?

	a	*b*
1.	$68-29=n$	$52-29=n$
2.	$71-32=n$	$47-27=n$
3.	$59-21=n$	$30-18=n$



Using Tens in Subtraction

You can solve the equation $22-7=n$ on the number line in two steps as shown. The first step is that of subtracting 2 from 22 to bring it back to 20. Then you subtract 5 from 20. The steps are shown below.

	$22-7=n$
This becomes	$(22-2)-5=n$
This becomes	$20-5=n$
Then	$15=n$

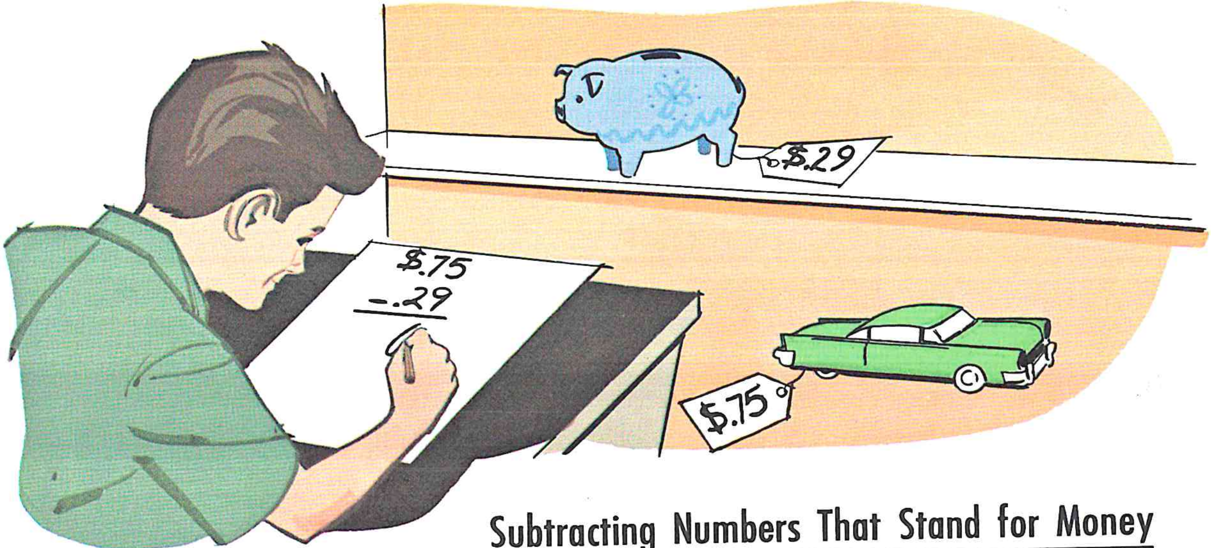
Oral Be ready to tell the thinking steps used in changing the equations in *a* to the equations in *b*. Then tell the value of n in each equation that follows.

	a	*b*
1.	$55-7=n$	$(55-5)-2=n$
2.	$71-6=n$	$(71-1)-5=n$
3.	$52-9=n$	$(52-2)-7=n$
4.	$34-8=n$	$(34-4)-4=n$
5.	$45-6=n$	$(45-5)-1=n$
6.	$31-7=n$	$(31-1)-6=n$
7.	$63-8=n$	$(63-3)-5=n$
8.	$24-6=n$	$(24-4)-2=n$
9.	$98-9=n$	$(98-8)-1=n$
10.	$85-8=n$	$(85-5)-3=n$

Written Write each equation in *b* above. Then find the value of n. Do as much of the work as you can without using pencil and paper.

Can you do this? Replace each dot in the subtractions below with the missing numeral.

a	*b*	*c*	*d*
●2	●8	●●	●●
−●	−●	−7	−4
3	●	34	17



Subtracting Numbers That Stand for Money

John bought a plastic car for $.75 and a piggy bank for $.29. How much less did he spend for the piggy bank than for the plastic car? Two sets are to be compared, and so you subtract the numbers.

In shorter form the problem can be expressed as 75 − 29 = n. In column form the subtraction is written as shown. Think: 9 is more than 5; so exchange 1 dime for 10 pennies. 10 pennies are added to 5 pennies in the minuend. Subtract like this:

$$\begin{array}{r} \$.75 \\ -.29 \\ \hline \$.46 \end{array}$$

Cents: 15 − 9 = 6

Dimes: 6 − 2 = 4

John spent 4 dimes and 6 pennies, or $.46, less for the bank than for the car.

Oral Tell the steps you would take in making the subtractions below.

a	*b*	*c*	*d*
$.58 −.07	$.65 −.40	$.75 −.09	$.98 −.89

Do you see that subtracting 0 from a number as in *a*, *b*, and *c* above does not change the number?

Written Copy. Write each difference. Check by adding.

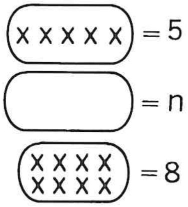
	a	*b*	*c*	*d*
1.	$.79 −.06	$.27 −.08	$.98 −.27	$.95 −.69
2.	$.87 −.78	$.61 −.45	$.32 −.19	$.35 −.25
3.	$.42 −.15	$.66 −.47	$.82 −.39	$.45 −.43
4.	$.61 −.24	$.38 −.18	$.91 −.37	$.33 −.09

Finding the Number Needed

Ray needs 8 stamps to fill a page. His mother gave him 5 stamps. How many more stamps does he need?

The problem tells you that some stamps are to be joined to 5 stamps. The new group, or set, will have 8 stamps in it. The equation is 5+n=8.

The picture may help you *see* the problem.



The stamps Ray has

More stamps needed

The stamps Ray needs altogether

You will know the value of n when you find out by how many one set is greater than another.

To find the value of n, you can do either of two things:

a. Find out how many to add to 5 to bring it to 8.

b. Compare 5 and 8 to find by how many they differ in number.

In the second of the two ways, you are using subtraction. You can take the steps that follow.

a. Use 8 to stand for the stamps Ray needs.

b. Use 5 to stand for the stamps he has.

c. Use – to stand for the idea of comparing two numbers to find the difference between them.

d. Use n to stand for the missing number.

e. Write the equation 8 – 5 = n. Is the missing number 3?

Oral Be ready to tell the addition equation and then the subtraction equation to use in solving each problem below.

1. Amy needs 7 pennies. She has 3 pennies. How many more pennies does she need?

2. Dave needs 6 marbles. He has only 4 marbles. How many more marbles does he need?

Written Follow these directions.

1. Solve problem 1 above.

2. Solve problem 2 above.

Solve the following problems.

3. Donna needs 24 beads to finish her necklace. She has only 16. How many more beads does she need?

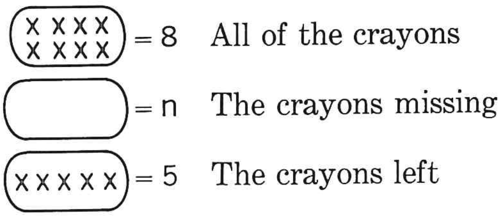
4. Dirk needs to roll 50 papers for his route. He has rolled 37. How many more does he need to roll?

Finding the Number Missing

Read this problem. Find out what story is told and pay special attention to the question.

Jane had 8 crayons in a box. A day later she looked into the box and saw only 5 crayons. How many of the crayons were missing?

The picture may help you *see* the problem.



The question tells you that one set of crayons is to be thought of as taken apart. So you subtract the numbers. Change the problem into the language of arithmetic like this:

a. Use 8 to stand for all 8 crayons.

b. Use 5 to stand for the crayons Jane sees.

c. Use − to stand for subtract.

d. Use n to stand for the missing number.

e. Write the equation $8-n=5$. Think: 8 is 3 more than 5. Thus $8-3=5$. The missing number is 3.

There are 3 crayons missing. The answer to the problem is 3 crayons.

Oral Tell the equation to use in solving each problem below. Reminder: The signs $ and . are used only as part of the final answer.

1. Mary saw 9 ducks on a pond. When she looked again only 3 ducks were on the pond. How many of the ducks had flown away?

2. Arthur had $.20. He spent some of the money during the day. At night he had only $.11. How much money had he spent?

Written Follow these directions.

1. Solve problem 1 above. Find the difference.

2. Solve problem 2 above. Find the difference.

Solve problems 3 through 5. Find each difference. Remember to write the signs $ and . only in the answer to each problem.

3. Larry had 16 oranges in a bag. He ate some and had 9 left. How many oranges had he eaten?

4. Dan had $.85. He lost all but $.29 through a hole in his pocket. How much did he lose?

5. Nora had $.41. She spent some during the day and had $.06 left. How much money did she spend?

Should You Add or Subtract?

Pay special attention to the question in each problem below, and decide how you are to think about the sets in each problem. Remember:

a. Add, if you could find the answer by joining groups, or sets.

b. Subtract, if you could find the answer by taking a set apart or by finding by how many one set is greater than another.

Oral Be ready to tell whether you must add or subtract to solve these problems. Tell which equation you would use in each one. Reminder: The signs $ and . are *not* to be used in equations. They are included only in the final answer to a problem.

1. Helen saw 6 robins, 3 bluebirds, and 2 orioles. How many birds did she see in all?

2. Robert weighed 98 pounds and then gained 5 pounds. How much does he weigh now?

3. John had 25¢ and spent 9¢ for a pad of writing paper. How much money did he have left?

4. Tom passed out arithmetic workbooks to the children. He had 30 books. After he had given one to each child, he had 5 left. How many children were present?

5. Ted's father is 35 years old and Ted is 9 years old. How much younger is Ted than his father?

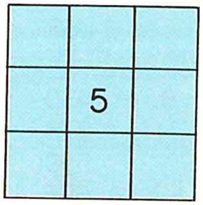
6. Bill's storybook has 96 pages in it. He has read 8 pages. How many more pages in his book does he have to read?

7. Jack's father bought 14 gallons of gasoline at one station and 9 at another. How much did he buy altogether?

8. Ann has a birthday 27 days from today. Judy's birthday comes 8 days after Ann's. How many days must Judy wait for her birthday?

Written Solve problems 1 through 8 above. Remember to include the signs $ and . only in the answer.

Can you do this? Draw a square on your paper, with cross lines to make nine squares, as shown. Put 5 in the center square. Then write the other numerals 1 through 9 in the squares in such a way that the numerals in each row—up, down, and crosswise—add up to 15. Here is a hint: Put 2, 4, 6, and 8 in the corner squares.



Reviewing Addition and Subtraction

Copy and find each sum. Check by adding in another order.

	a	*b*	*c*	*d*
1.	24 +35	36 +42	36 +27	54 +19
2.	82 +73	55 +93	56 +89	66 +77
3.	324 +504	275 +423	236 +348	307 +549
4.	432 +293	584 +354	386 +912	257 +842
5.	647 +495	508 +492	3012 +5867	4124 +5653
6.	2178 +5416	3209 +6549	1284 +4574	4156 +3652
7.	2234 +5965	3452 +3837	4207 +7582	5041 +8736
8.	37 92 48 +65	88 66 77 +99	21 10 14 +23	11 32 33 +42
9.	430 278 559 +695	703 668 477 +859	525 624 987 +204	245 413 265 +310
10.	3475 8621 9374 +6829	9999 7777 8888 +5555	2787 9165 9385 +7650	4321 5605 4759 +3084

Now copy these subtractions and find each difference. Check by adding.

	a	*b*	*c*	*d*
11.	8 −5	7 −2	9 −4	8 −7
12.	9 −6	7 −5	8 −4	9 −2
13.	14 −9	17 −8	11 −6	16 −9
14.	12 −7	17 −9	15 −8	13 −4
15.	78 −6	61 −3	96 −5	$.45 −.05
16.	86 −39	53 −13	95 −26	$.62 −.47
17.	80 −46	49 −13	57 −29	$.32 −.17
18.	74 −68	29 −20	90 −52	$.81 −.14

Another way Check your addition by crossing out the top addend. Add the others. Then add the top addend to the sum of the others. The final sum in each addition must be the same.

$$\begin{array}{r} 9 \\ 6 \\ +8 \\ \hline 23 \end{array} \qquad \begin{array}{r} \cancel{9} \\ 6 \\ +8 \\ \hline 14 \\ +9 \\ \hline 23 \end{array}$$

$$23 \xrightarrow{\text{Same}} 23$$

Subtracting Two-Digit from Three-Digit Numbers

Mr. Jenkins had 481 pumpkins to sell at his roadside stand. He sold 79 the first day. How many did he have left to sell?

The equation for this problem is 481 − 79 = n. You can find n by subtracting, as in A.

Ones: Change the form of 1 ten to 10 ones and add 10 ones to the 1 one. Think: 11 − 9 = 2. Write 2 ones.

A

$$\begin{array}{r|c|c} \text{H} & \text{T} & \text{O} \\ & 7 & 11 \\ 4 & \cancel{8} & \cancel{1} \\ - & 7 & 9 \\ \hline 4 & 0 & 2 \end{array}$$

Tens: Think: 7 tens left − 7 tens = 0 tens. Write 0.

Hundreds: Write the 4 hundreds. Mr. Jenkins had 402 pumpkins left to sell.

The equation 200 − 67 = n shown in B has no ones and no tens in the minuend.

B

$$\begin{array}{r|c|c} \text{H} & \text{T} & \text{O} \\ & 9 & \\ 1 & \cancel{10} & 10 \\ \cancel{2} & \cancel{0} & \cancel{0} \\ - & 6 & 7 \\ \hline 1 & 3 & 3 \end{array}$$

You must change the form of 1 hundred to 10 tens and then change the form of 1 ten to ten ones before you subtract. Think: 10 ones − 7 ones = 3 ones. 9 tens left − 6 tens = 3 tens.

There is 1 hundred left. The value of n is 1 hundred, 3 tens, and 3 ones, or 133. 200 − 67 = 133.

Do you see that you change the form of 1 hundred to 10 tens in the same way that you change the form of 1 ten to 10 ones?

Oral Tell the steps you would take in finding the difference in each subtraction below.

	a	*b*	*c*	*d*
1.	349 −27	764 −51	983 −56	231 −16
2.	418 −34	664 −75	304 −32	800 −65

Written Copy. Subtract, and check each difference. Change the form of 1 ten to 10 ones and the form of 1 hundred to 10 tens when necessary.

	a	*b*	*c*	*d*
1.	582 −52	176 −63	162 −58	690 −67
2.	140 −50	528 −45	752 −90	721 −79
3.	672 −85	837 −58	221 −18	847 −95
4.	700 −87	408 −29	500 −46	900 −73

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Subtracting Three-Digit Numbers

The only new step on this page is that of subtracting hundreds from hundreds.

John's father bought a new car. He drove it 500 miles the first week and 287 miles the second week. How many more miles did he drive the first week than the second?

The equation for the problem is $500-287=n$. The equation can be written in column form.

$$\begin{array}{r|r|r} \text{H} & \text{T} & \text{O} \\ & 9 & \\ 4 & \cancel{10} & 10 \\ \cancel{5} & \cancel{0} & \cancel{0} \\ -2 & 8 & 7 \\ \hline 2 & 1 & 3 \end{array}$$

Study the subtraction in the grid. You subtract hundreds in the same way that you subtract ones or tens. What is the value of n in the equation $500-287=n$? What change in form was made in the ones? What changes were made in the tens?

Oral Study the subtractions in *a*, *b*, *c*, and *d*. Explain the steps you would take to find the difference in each one. What steps would you take if the numbers *a* through *d* were money numbers?

MORE PRACTICE PAGE 301

a	*b*	*c*	*d*
637 −212 425	597 −338 259	560 −267 293	403 −189 214

Written Copy the subtractions below and find each difference. Check.

	a	*b*	*c*	*d*
1.	979 −496	324 −133	568 −375	\$5.35 −2.90
2.	360 −154	772 −336	594 −365	\$5.85 −2.68
3.	970 −485	745 −396	325 −136	\$4.25 −2.98
4.	907 −488	503 −276	800 −261	\$5.00 −2.75
5.	907 −418	620 −129	711 −199	\$3.11 −1.98

Another way The equation $457-99=n$ can be easily solved as follows:

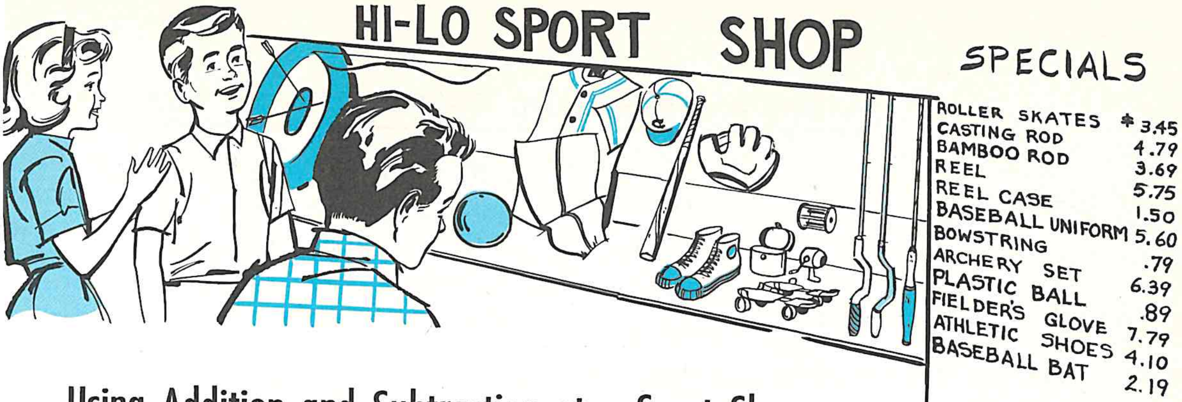
$$\begin{aligned} (457-100)+1 &= n \\ 357+1 &= n \\ 358 &= n \end{aligned}$$

The equation $500-287=n$ can be solved as follows:

$$\begin{aligned} (500-300)+13 &= n \\ 200+13 &= n \\ 213 &= n \end{aligned}$$

Tell the thinking steps you could use in solving these equations.

	a	*b*
1.	$365-89=n$	$415-299=n$
2.	$718-95=n$	$878-395=n$



SPECIALS

ROLLER SKATES	$3.45
CASTING ROD	4.79
BAMBOO ROD	3.69
REEL	5.75
REEL CASE	1.50
BASEBALL UNIFORM	5.60
BOWSTRING	.79
ARCHERY SET	6.39
PLASTIC BALL	.89
FIELDER'S GLOVE	7.79
ATHLETIC SHOES	4.10
BASEBALL BAT	2.19

Using Addition and Subtraction at a Sport Shop

Oral Tell whether you would add or subtract in doing the problems on this page, and why. Then tell how to change each problem below into an equation. Explain the steps you would take to solve each problem.

1. Margaret has $7.00. She wants to buy an archery set. How much money will she have left?

2. How much money will Charles need to buy a baseball uniform and athletic shoes?

Written Follow these directions.

Write equations for problems 1 and 2 and solve them. Number your problems 1 and 2.

Solve each of the following problems. Check your additions by adding in another way. Check your subtractions by adding.

3. John wants to buy a pair of roller skates and an archery set. How much would both cost?

4. Tom has saved $2.00. If he buys a bowstring, how much money will he have left?

5. Karen wants to buy a reel and a reel case for her father's birthday. How much would she have to pay for both?

6. Roy has saved $.98. How much more must he save before he can buy a baseball bat?

7. What would Dick have to pay for a fielder's glove and a casting rod?

8. Harry has saved $3.25. He wants a bamboo rod. How much more money will he need?

9. Ruth wants to buy a casting rod and a plastic ball. How much money does she need?

10. Arthur has saved $3.65 to buy a birthday present for his father. He wants to buy him a casting rod. How much more money does he need?

Adding and Subtracting Without Reminder Numerals

A	B	C	D
$\begin{array}{r} {}^{1\,1} \\ 387 \\ +265 \\ \hline 652 \end{array}$	$\begin{array}{r} 387 \\ +265 \\ \hline 652 \end{array}$	$\begin{array}{r} \overset{5}{\cancel{6}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{10}{\cancel{0}} \\ -147 \\ \hline 453 \end{array}$	$\begin{array}{r} 600 \\ -147 \\ \hline 453 \end{array}$

Study A above. What do the small reminder numerals show? You may be able to do the addition without writing the reminder numerals. Then find the sum as shown in B.

Now study C. What do the reminder numerals show? Perhaps you can remember these changed forms, also, without writing reminder numerals. Find the difference as in D.

Oral Study the following additions. Using A and B above to guide you, tell what steps you would take to find the sums.

	a	*b*	*c*	*d*
1.	292 +425	327 +128	175 +67	764 +423

Using C and D to help you, tell what steps you would take to find each difference below.

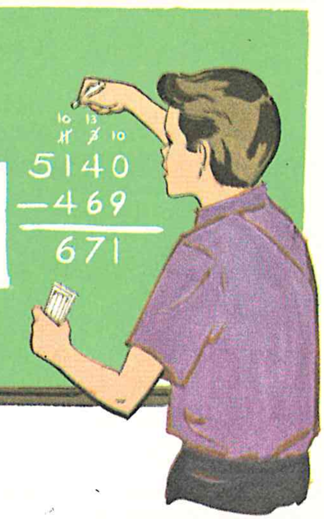
	a	*b*	*c*	*d*
2.	836 −678	213 −82	421 −275	612 −349

Written Copy the following column additions. Find each sum, and check by adding in another order. When you need to change the form of 10 ones to 1 ten or 10 tens to 1 hundred, do not write reminder numerals.

	a	*b*	*c*	*d*
1.	345 +297	109 +503	604 +328	35 +268
2.	231 102 +302	309 605 +203	216 10 +657	192 346 +241
3.	296 372 +124	163 24 +163	40 72 +165	9 613 +585

Now copy the subtractions below. Find each difference, and check by adding. When you need to change the form of 1 ten to 10 ones, or 1 hundred to 10 tens, do so without writing reminder numerals.

	a	*b*	*c*	*d*
4.	434 −176	520 −485	523 −345	\$8.84 −1.96
5.	354 −91	703 −326	475 −127	\$9.35 −1.63
6.	800 −576	827 −239	264 −89	\$7.42 −1.63
7.	946 −938	946 −893	663 −187	\$4.73 −.76



Subtracting Three-Digit from Four-Digit Numbers

Study the subtraction in A. Before you can subtract, you must change the form of 1 thousand to 10 hundreds, the form of 1 hundred to 10 tens, and the form of 1 ten to 10 ones. Read the difference.

A

$$\begin{array}{c|c|c|c} \text{Th} & \text{H} & \text{T} & \text{O} \\ & 10 & 13 & \\ 4 & \cancel{11} & \cancel{3} & 10 \\ \cancel{5} & \cancel{1} & \cancel{4} & \cancel{0} \\ - & 4 & 6 & 9 \\ \hline 4 & 6 & 7 & 1 \end{array}$$

Example B shows the subtraction of numbers that stand for money. The subtraction in B is done as it was in A. Read the difference.

B

$$\begin{array}{r} \$51.40 \\ -4.69 \\ \hline \$46.71 \end{array}$$

Oral Use what you have learned. Be prepared to tell the steps you would take to find the difference in each problem below. Use A and B above to help you.

	a	b	c	d
1.	4213 −704	9275 −233	1234 −143	$60.90 −9.10
2.	7952 −353	7543 −428	4007 −562	$51.29 −2.34

Written Follow these directions.

1. Copy row 1 in the oral exercise. Find each difference. Check.

2. Copy row 2 in the oral exercise. Find each difference. Check.

Copy the following subtractions and find each difference. Check by adding.

	a	b	c	d
3.	4514 −907	2953 −687	7062 −395	$16.30 −2.58
4.	6310 −852	1000 −123	3801 −932	$41.40 −5.79

Write each subtraction below in column form. Find the difference.

	a	b
5.	7080 − 568 = n	6950 − 279 = n
6.	5241 − 142 = n	1675 − 98 = n

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Subtracting Four-Digit Numbers

The only new step on this page is that of subtracting thousands from thousands.

Study this subtraction. What must be done before you can subtract? Explain how to find the difference. Read the difference.

A

Th	H	T	O
7	1	0	2
−5	4	7	6
1	6	2	6

Study the subtraction in example B. What must be done before you can subtract? Explain how to find the difference. Read the difference.

B

$40.05
−16.89
$23.16

Oral Using examples A and B to help you, be ready to explain the steps you would take to find the difference in each subtraction below.

	a	*b*	*c*	*d*
1.	6594 −1249	2948 −1083	3249 −2870	$40.99 −15.10
2.	7132 −4897	8004 −3796	9000 −6471	$89.75 −12.98

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Written Follow these directions.

1. Copy row 1 in column 1. Find each difference. Check by adding.

2. Copy row 2 in column 1. Check.

Copy each subtraction below and find the difference. Check by adding.

	a	*b*	*c*	*d*
3.	3020 −1234	9900 −1952	4463 −2985	$18.05 −11.48
4.	5817 −1049	9382 −7955	3896 −2851	$75.96 −27.84

Read the following problems, paying special attention to the question in each. Then write the equation for each problem. Solve it. Check by adding.

5. Mrs. West bought Susan a new coat. It had been reduced from $24.50 to $16.85. How much did Mrs. West save by buying the coat on sale?

6. The Longfellow School was built in 1948. How old is the building now?

A quick review

	a	*b*
1.	500 − 136 = n	997 − 798 = n
2.	2000 − 321 = n	5011 − 456 = n
3.	3001 − 1432 = n	1961 − 1812 = n
4.	4020 − n = 2000	2412 − n = 505

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. You can use the related addition fact to help you find the answer to a subtraction combination. (33)

2. In subtraction the number subtracted from is the minuend, the number subtracted is the subtrahend, and the number you get by subtracting is the difference. (33)

3. Whenever the minuend and subtrahend are the same, the difference between them is 0. (37)

4. You subtract ones from ones, tens from tens, hundreds from hundreds, and thousands from thousands. (41, 42, 48, 49, 51, 52)

Words to Know

1. Minuend, subtrahend, and difference (33)

2. Intersect (36)

3. Diagonal (36)

Questions to Discuss

1. How can you find the difference in a subtraction if you do not remember it? (33, 34, 36)

2. How do you use a table to solve the equation $17-9=n$? (36)

3. How can you decide whether to subtract the numbers in a problem in order to solve it? (38, 39, 40, 44, 45)

4. How can you use your knowledge of ten to help you subtract more quickly? (35, 49)

Written Practice

Copy in column form. Write each difference. Use addition in checking your work.

	a	*b*	
1.	$10-3=n$	$10-7=n$	(34)
2.	$11-5=n$	$11-6=n$	(35)
3.	$16-7=n$	$17-9=n$	(36)
4.	$39-5=n$	$41-8=n$	(41)

Copy. Write each difference.

	a	*b*	*c*	
5.	97 −35	61 −27	$.80 −.62	(42)
6.	989 −37	868 −49	617 −79	(48)
7.	768 −342	681 −328	829 −387	(50)
8.	5493 −3491	8392 −4279	6738 −2194	(54)

Self-Evaluation

Part 1 Copy. Write each difference. Check by adding.

	a	*b*	*c*	*d*
1.	49 −7	58 −8	68 −9	75 −8
2.	97 −36	59 −29	61 −48	80 −37

Part 2 Copy. Write each difference. Check by adding.

	a	*b*	*c*	*d*
1.	589 −76	376 −45	892 −47	785 −79
2.	878 −343	645 −241	787 −329	915 −219
3.	548 −398	915 −360	876 −398	754 −295

Part 3 Copy. Write each difference. Check by adding.

	a	*b*	*c*
1.	9879 −436	7869 −460	$53.87 −2.79
2.	3198 −169	5279 −193	$69.56 −8.75
3.	8695 −981	7852 −942	$85.01 −9.65
4.	9003 −798	8000 −217	$62.50 −9.98
5.	8993 −4543	6931 −4529	$54.25 −23.61
6.	7158 −4935	9030 −6185	$81.30 −59.75

Part 4 Solve these problems.

1. Mary Jane had $12.98 in her bank. Her mother gave her $1.75 more to put into her bank. How much money was in her bank after she put the $1.75 into it?

2. Roy's father drove 1560 miles in May and 1095 miles in June. How much farther had he driven in May than in June?

3. Nora needs $11.39 for a dress. She has saved $7.75. How much more money does she need before she can buy the dress?

4. Jack knew that he had spent $12.35 during the day. When he reached home at night he still had $2.17 in his pocket. How much money must he have had in his pocket when he started to shop that morning?

5. A loaded truck weighed 9050 pounds. The empty truck weighed 6975 pounds. What was the difference between the two weights?

4

Multiplication

Jane has arranged the shoes in groups, or sets, of 2. Each set has the same number, 2. Therefore the sets are equal in number. How many sets of 2 has she made?

Jane wants to know how many shoes are on the shoe rack altogether. To find out, she can add the numbers that tell how many in each of the sets, like this: 2+2+2+2+2=10. She has added five 2's.

A fast way to find how many there are in 5 sets of 2 is to multiply like this: 5×2=10. 5 times 2 means five 2's to be added. 5×2=10 is read: Five times two equals ten.

In column form, the multiplication is written as shown.

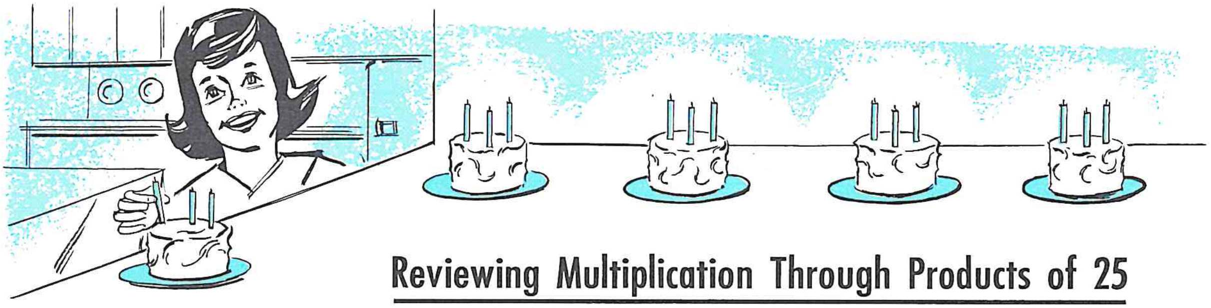
2	Number of shoes in each set
×5	Number of sets to be joined
10	Number of shoes altogether

The number to be multiplied is called the **multiplicand.** The number by which you multiply is called the **multiplier.** The number obtained as the answer of a multiplication is called the **product.**

2	multiplicand
×5	multiplier
10	product

Oral Read each statement below, supplying the missing number word. Reminder: A statement like *three* 2*'s* means *three* 2*'s to be added.*

	a	*b*
1.	Three 2's=__	3×2=n
2.	Two 3's=__	2×3=n
3.	Two 4's=__	2×4=n
4.	Four 2's=__	4×2=n
5.	Two 5's=__	2×5=n



Reviewing Multiplication Through Products of 25

Janet wants to put 3 candles on each little cake for a party for her little sister. Janet has 5 little cakes. How many candles does she need?

You are to think of 5 sets of 3 candles each as being together. Because there is the same number of candles in each set, you multiply. The equation is 5×3=n. In column form the multiplication is written as shown. Think: Five 3's (added) are 15. Janet needs 15 candles.

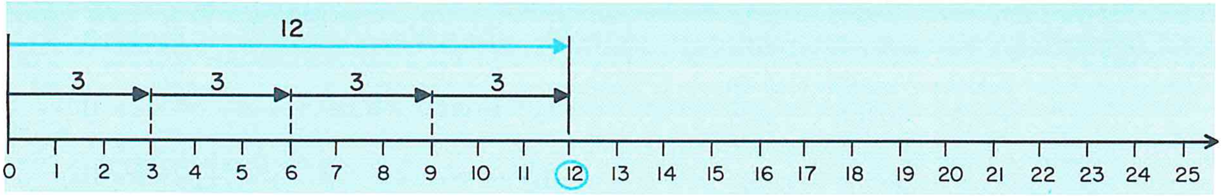
$$\begin{array}{r} 3 \\ \times 5 \\ \hline 15 \end{array}$$

Oral Read. Supply each product. Reminder: Doing repeated addition on a number line helps you find a product. Does 3+3+3+3=12? Does 4×3=12?

	a	*b*
1.	2×9=n	9×2=n
2.	3×6=n	6×3=n
3.	2×7=n	7×2=n
4.	2×6=n	6×2=n
5.	3×5=n	5×3=n
6.	3×4=n	4×3=n
7.	2×8=n	8×2=n
8.	3×7=n	7×3=n
9.	3×8=n	8×3=n
10.	4×4=n	5×5=n
11.	4×5=n	5×4=n
12.	6×4=n	4×6=n

Written Write each equation in rows 1 through 12 in column form, supplying each product.

Something to do Make practice cards for multiplications through 25. Practice using them.



Reviewing Multiplication Through Products of 45

The table below shows all multiplications through 45. The strips will help you see how to find the product of 5 and 6. How will you use the table to find the product of 6 and 7? Of 8 and 4? Of 9 and 3?

In multiplication, the multiplier and the multiplicand can be interchanged at any time. The table shows that 5×6=30 and that 6×5=30. Therefore 5×6=6×5. Does 6×7=7×6? Does 8×4=4×8?

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	㉚	35	40	45
6	6	12	18	24	㉚	36	42	48	
7	7	14	21	28	35	42	49		
8	8	16	24	32	40				
9	9	18	27	36	45				

Do you see that multiplying a number by 1 doesn't change the number? Multiplying 1 by a number doesn't change the number, either.

1×2=2　2×1=2
1×3=3　3×1=3
1×4=4　4×1=4

Oral Use the table to help you find the value of n in each equation that follows.

	a	*b*
1.	3×9=n	9×3=n
2.	4×7=n	7×4=n
3.	6×7=n	7×6=n
4.	5×8=n	8×5=n
5.	4×8=n	8×4=n
6.	5×9=n	9×5=n
7.	4×9=n	9×4=n

Written Write each equation in rows 1 through 7 in column form, and find each product.

Another way If you forget the product of two numbers, you can find it by doing one of these things:

1. Add the number to be multiplied, like this for 3×6=n:
6+6+6=18. Then 3×6=18.

2. Multiply, using a fact you know, and then add. For 3×6=n, think: 2×6=12. 1×6=6. 12+6=18.

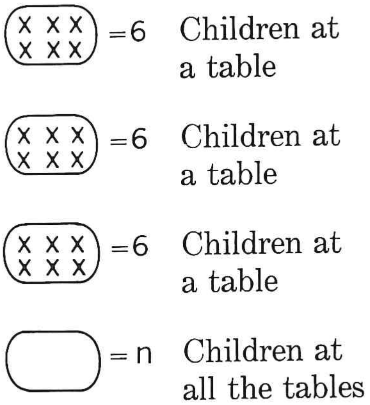
Something to do Make practice cards for any multiplication facts that you do not know.

MORE PRACTICE PAGE 302

Using Multiplication to Solve Problems

Donald counted 6 children seated at each of 3 tables. How many children were seated at all of the tables?

Here is the story problem in pictures.



You are to think of 3 groups, or sets, of 6 children each as being together. Because the sets all have the same number, 6, you multiply.

The equation for this problem is $3\times6=n$. Think: Three 6's (added) are 18. $3\times6=18$. The value of n is 18. There were 18 children at the tables.

You can check the multiplication by interchanging the 6 and the 3 and multiplying again. Does $6\times3=18$?

Oral Tell the equation you would use in solving problems 1 through 5. Also tell how you knew that you should multiply.

1. Betty bought 5 boxes of crayons with 8 crayons in a box. How many crayons did she buy?

2. Dick and Sam planted 5 tulip bulbs in each of the 9 flower pots. How many tulip bulbs did they plant?

3. The classroom has 7 rows of seats with 4 seats in each row. How many seats are there in all?

4. Joyce arranged her collection of shells in 8 rows with 5 shells in a row. How many shells did she have in her collection?

5. A box of candy has 6 rows of pieces of candy with 4 pieces in each row. How many pieces of candy are there in the box?

Written Write an equation for problems 1 through 5 above. Then find the value of each n.

A quick review Reminder: The ( ) means *do this operation first.*

	a	*b*
1.	$(4\times7)+7=n$	$(5\times8)+8=n$
2.	$(4\times9)+9=n$	$(6\times5)+5=n$
3.	$(7\times5)+5=n$	$(5\times9)+9=n$
4.	$(8\times4)+4=n$	$(4\times6)+6=n$

Multiplying Tens

Janet has 4 boxes of pencils with 10 pencils in a box. How many pencils has she in all?

The 4 sets of pencils are to be together. Each set has the same number of pencils in it. Therefore you can solve the problem by multiplying 10 by 4.

Think: Four 10's (added) are how many? The answer is 40. Janet has 40 pencils. Do 4 sets of 10 each equal 40?

Look at the equations in each row below. How does each product in B differ from the product in the corresponding row in A?

A	**B**
4×1=4	4×10=40
4×2=8	4×20=80
4×3=12	4×30=120
4×4=16	4×40=160
4×5=20	4×50=200

What product would you expect for each multiplication that follows: 4×60, 4×70, 4×80, 4×90, 5×10, 5×20, 5×30?

Do you see that the product of 0 and another number is 0?

Oral Be ready to complete each statement below.

	a	*b*
1.	5×10=n	5×1 ten=__ tens
2.	5×20=n	5×2 tens=__ tens
3.	6×10=n	6×1 ten=__ tens
4.	7×30=n	7×3 tens=__ tens
5.	8×40=n	8×4 tens=__ tens
6.	9×50=n	9×5 tens=__ tens

Written Write each equation below, replacing n with the missing numeral.

	a	*b*
1.	8×50=n	6×60=n
2.	3×90=n	5×60=n
3.	5×80=n	5×90=n
4.	7×40=n	8×50=n
5.	9×50=n	5×50=n
6.	4×70=n	6×70=n
7.	4×80=n	4×90=n
8.	7×50=n	5×70=n
9.	9×40=n	8×40=n
10.	7×60=n	7×40=n

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Multiplying Tens and Ones by Ones

Alan has 4 bags of marbles, with 21 marbles in each bag. How many marbles are there in all 4 bags?

The 4 sets of marbles are to be together. Each set has the same number of marbles in it. Therefore you can solve the problem by multiplying. The equation is $4 \times 21 = n$.

Before you try to find the product, think of 21 as $20+1$. Then you can do the multiplication by multiplying 4×1 and 4×20 to find each part of the product, or **partial product.** Find the product by adding the partial products. Study the example below.

$$\begin{array}{lrl}
 & 21 & \text{means } 20+1 \\
 & \times 4 & \text{means 4 of each} \\ \cline{2-2}
4 \times 1 = & 4 & \text{1st partial product} \\
4 \times 20 = & 80 & \text{2nd partial product} \\ \cline{2-2}
\text{Add} & 84 & \text{product}
\end{array}$$

The multiplication can also be done in a grid, as shown.

$$\begin{array}{l|c|c}
 & \text{T} & \text{O} \\
 & 2 & 1 \\
 & \times & 4 \\ \hline
4 \times 1 \text{ one} = 4 \text{ ones} = & & 4 \\
4 \times 2 \text{ tens} = 8 \text{ tens} = & 8 & 0 \\ \hline
\text{Add} & 8 & 4
\end{array}$$

MORE PRACTICE PAGE 302

The product is 8 tens and 4 ones, or 84. Alan has 84 marbles.

The multiplication $5 \times 61 = n$ can be solved by thinking of 61 as $60+1$ and by multiplying as shown.

$$\begin{array}{l|c|c|c}
 & \text{H} & \text{T} & \text{O} \\
 & & 6 & 1 \\
 & & \times & 5 \\ \hline
5 \times 1 \text{ one} = 5 \text{ ones} = & & & 5 \\
5 \times 6 \text{ tens} = 30 \text{ tens} = & 3 & 0 & 0 \\ \hline
\text{Add} & 3 & 0 & 5
\end{array}$$

The form of the second partial product, 30 tens, was changed to 3 hundreds. Why?

Oral Be ready to tell how to find each product without using the grid and then with using the grid.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}42\\ \times 2\\ \hline\end{array}$	$\begin{array}{r}33\\ \times 2\\ \hline\end{array}$	$\begin{array}{r}31\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}43\\ \times 2\\ \hline\end{array}$
2.	$\begin{array}{r}23\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}21\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}33\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}41\\ \times 2\\ \hline\end{array}$
3.	$\begin{array}{r}41\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}52\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}81\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}51\\ \times 6\\ \hline\end{array}$
4.	$\begin{array}{r}51\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}51\\ \times 8\\ \hline\end{array}$	$\begin{array}{r}61\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}21\\ \times 5\\ \hline\end{array}$

Written Copy each multiplication above. Find each product.

Can you multiply 92 by 3?

The Equation Method

$$\begin{array}{lr} & 3\times 92 = n \\ \text{Means} & (3\times 90)+(3\times 2) = n \\ \text{Then} & 270+6 = n \\ \text{Then} & 276 = n \end{array}$$

The Grid Method

$$\begin{array}{l|c|c|c} & \text{H} & \text{T} & \text{O} \\ & & 9 & 2 \\ & & \times & 3 \\ \hline 3\times 2 \text{ ones} = 6 \text{ ones} = & & & 6 \\ 3\times 9 \text{ tens} = 27 \text{ tens} = & 2 & 7 & 0 \\ \hline \text{The sum is} & 2 & 7 & 6 \end{array}$$

More Two-Digit Numbers to Multiply

The illustration on the board above helps you see how to solve the equation 3×92=n.

The illustration below shows how you can multiply ones and then tens in solving such equations as 3×28=n. Think of 28 as 20+8. Then multiply.

$$\begin{array}{lr} & 28 \\ & \times 3 \\ \hline 3\times 8 = & 24 \\ 3\times 20 = & 60 \\ \hline \text{Add} & 84 \end{array} \qquad \begin{array}{l|c|c} & \text{T} & \text{O} \\ & 2 & 8 \\ & \times & 3 \\ \hline 3\times 8 \text{ O} = 24 \text{ O} = & 2 & 4 \\ 3\times 2 \text{ T} = 6 \text{ T} = & 6 & 0 \\ \hline \text{Add} & 8 & 4 \end{array}$$

The value of n is 8 tens and 4 ones or 84.

You will often need to change the form of both partial products as you do in solving the equation 5×28=n. Think of 28 as 20+8. Then multiply.

$$\begin{array}{lr} & 28 \\ & \times 5 \\ \hline 5\times 8 = & 40 \\ 5\times 20 = & 100 \\ \hline \text{Add} & 140 \end{array} \qquad \begin{array}{l|c|c|c} & \text{H} & \text{T} & \text{O} \\ & & 2 & 8 \\ & & \times & 5 \\ \hline 5\times 8 \text{ O} = 40 \text{ O} = & & 4 & 0 \\ 5\times 2 \text{ T} = 10 \text{ T} = & 1 & 0 & 0 \\ \hline \text{Add} & 1 & 4 & 0 \end{array}$$

Oral Be ready to tell the steps you would take in finding each product below.

a	*b*	*c*	*d*
25 ×3	56 ×4	43 ×5	44 ×6

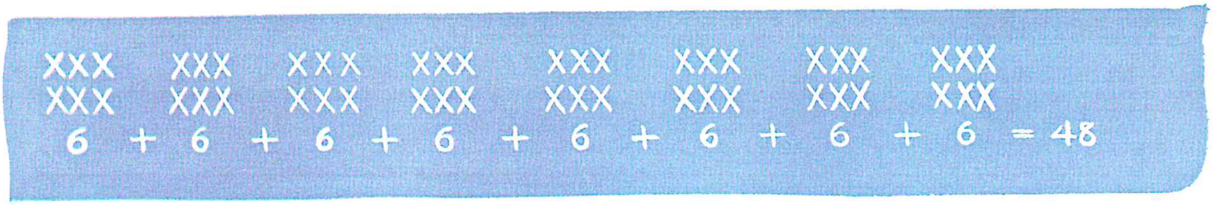
Written Follow these directions.

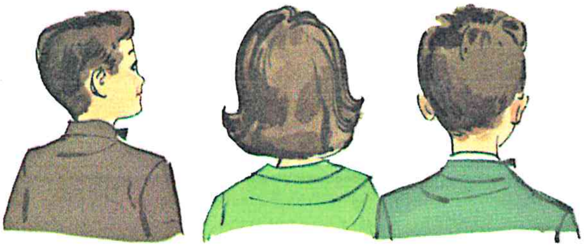
1. Copy the four multiplications above. Find each product. Check by using addition.

Copy. Find each product.

	a	*b*	*c*	*d*
2.	29 ×2	36 ×5	14 ×5	27 ×3
3.	18 ×2	45 ×2	13 ×5	24 ×4
4.	14 ×6	36 ×2	24 ×5	36 ×4
5.	19 ×2	54 ×8	98 ×2	89 ×3
6.	34 ×6	25 ×7	53 ×6	27 ×5

MORE PRACTICE PAGE 303


XXX XXX XXX XXX XXX XXX XXX XXX
XXX XXX XXX XXX XXX XXX XXX XXX
6 + 6 + 6 + 6 + 6 + 6 + 6 + 6 = 48



Using 6 in Multiplication

Look at the picture above. Are there 8 groups, or sets, of X's? Are there 6 X's in each set? Eight 6's, when added, equal 48.

What is the sum when you add six 8's? When you add nine 6's? When you add six 9's?

The fast way to find the sum for repeated additions is to multiply, as shown below.

$8\times6=48$ $6\times8=48$

$9\times6=54$ $6\times9=54$

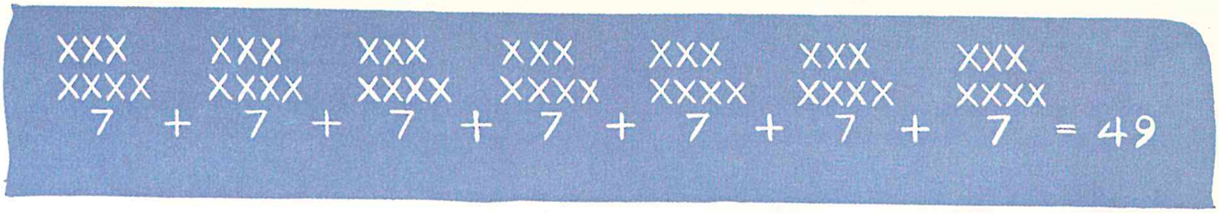
You will need to know the multiplication facts given above.

Oral Be ready to tell the value of n in each equation below.

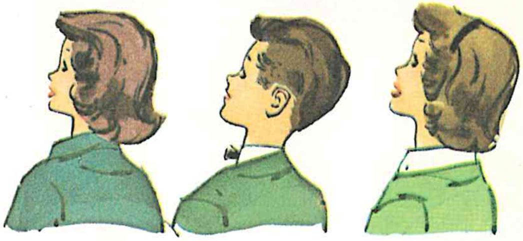
	a	*b*
1.	$1\times6=n$	$6\times1=n$
2.	$2\times6=n$	$6\times2=n$
3.	$3\times6=n$	$6\times3=n$
4.	$4\times6=n$	$6\times4=n$
5.	$5\times6=n$	$6\times5=n$
6.	$6\times6=n$	$6\times n=36$
7.	$7\times6=n$	$6\times7=n$
8.	$8\times6=n$	$6\times8=n$
9.	$9\times6=n$	$6\times9=n$
10.	$6\times n=48$	$n\times6=54$
11.	$6\times n=54$	$8\times n=48$
12.	$n\times9=54$	$n\times8=48$
13.	$n\times6=48$	$9\times n=54$
14.	$7\times n=42$	$6\times n=42$
15.	$n\times6=42$	$n\times7=42$
16.	$n\times5=30$	$6\times n=36$

Written Write the equations in rows 1 through 16 in column form. Write each product.

Something to do Make practice cards for any multiplications with 6 that you do not already know. Practice using them.



Using 7 in Multiplication



Look at the picture above. Seven 7's have been added. The sum is 49. Does $7\times7=49$? What is the sum when you add eight 7's? Seven 8's? Nine 7's? Seven 9's?

The fast way to find the sum for repeated additions is to multiply, as shown below.

$8\times7=56$ $7\times8=56$

$9\times7=63$ $7\times9=63$

You will need to know the multiplication facts given above.

Oral Be ready to tell the value of n in the following equations.

	a	*b*
1.	$6\times5=n$	$8\times7=n$
2.	$2\times7=n$	$6\times3=n$
3.	$9\times2=n$	$5\times9=n$
4.	$6\times7=n$	$9\times7=n$
5.	$7\times6=n$	$7\times7=n$
6.	$7\times8=n$	$7\times9=n$
7.	$3\times7=n$	$7\times3=n$
8.	$8\times6=n$	$5\times7=n$
9.	$7\times4=n$	$6\times9=n$
10.	$7\times5=n$	$6\times6=n$
11.	$9\times n=63$	$n\times8=56$
12.	$6\times n=48$	$7\times n=56$
13.	$8\times n=56$	$7\times n=35$
14.	$n\times5=35$	$n\times7=63$
15.	$7\times n=63$	$5\times n=35$
16.	$n\times6=48$	$n\times8=48$
17.	$n\times5=35$	$n\times7=56$
18.	$8\times n=56$	$n\times9=63$

Written Write the equations in rows 1 through 18 in column form. Find each product.

Something to do Make practice cards for the multiplications with 7. Practice until you can give each product quickly.

Using 8 and 9 in Multiplication

The table below shows all of the multiplications through 81.

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

Use the above table to prove each of the following statements.

$8\times8=64$ $9\times9=81$

$8\times9=72$ $9\times8=72$

Oral Be ready to tell the value of n in the following equations.

	a	*b*
1.	$4\times8=n$	$5\times9=n$
2.	$8\times9=n$	$4\times9=n$
3.	$2\times8=n$	$8\times8=n$
4.	$9\times9=n$	$3\times9=n$
5.	$8\times7=n$	$5\times4=n$
6.	$9\times8=n$	$6\times7=n$
7.	$9\times6=n$	$7\times8=n$
8.	$7\times9=n$	$6\times5=n$
9.	$6\times8=n$	$6\times9=n$
10.	$5\times8=n$	$9\times5=n$
11.	$8\times n=64$	$8\times n=72$
12.	$9\times n=81$	$8\times n=64$
13.	$9\times n=72$	$n\times9=72$
14.	$n\times9=72$	$n\times9=81$
15.	$n\times7=56$	$n\times5=35$
16.	$7\times n=35$	$n\times6=48$

Written Write the equations in rows 1 through 16 in column form and find each product. Check by multiplying again.

Another way Suppose you forget the product of 8 and 7, but recall that $7=5+2$. You can think of 8×5, then 8×2, and add the partial products. Do this: $8\times5=40$ and $8\times2=16$. $40+16=56$. So $8\times7=56$.

Something to do Make practice cards for multiplications with 8 and 9. Practice using them until you can give each product quickly.

Reviewing the Multiplication Facts

If there are any multiplication facts that you are not sure you know, use practice cards to learn them.

Oral See how quickly you can say the product for the multiplications in each of the following rows.

	a	*b*	*c*	*d*
1.	2 ×2	3 ×1	7 ×3	5 ×2
2.	1 ×4	5 ×3	7 ×1	1 ×2
3.	4 ×3	1 ×1	1 ×6	3 ×3
4.	4 ×1	3 ×5	8 ×1	6 ×3
5.	3 ×2	4 ×4	6 ×1	9 ×2
6.	1 ×5	6 ×2	8 ×2	5 ×4
7.	7 ×4	2 ×5	3 ×4	2 ×3
8.	9 ×1	4 ×2	5 ×1	2 ×4
9.	8 ×7	6 ×4	7 ×6	2 ×1
10.	6 ×6	6 ×5	7 ×2	2 ×6
11.	6 ×9	3 ×8	5 ×6	5 ×5
12.	3 ×9	6 ×7	4 ×7	6 ×8
13.	4 ×6	2 ×8	3 ×6	2 ×9
14.	7 ×5	1 ×9	7 ×7	8 ×3
15.	8 ×6	7 ×8	1 ×8	7 ×9
16.	4 ×5	3 ×7	5 ×7	8 ×5
17.	2 ×7	8 ×4	9 ×7	9 ×3
18.	9 ×4	1 ×7	8 ×8	9 ×9
19.	8 ×9	9 ×6	4 ×8	9 ×5
20.	5 ×8	9 ×8	5 ×9	4 ×9

Written Now copy each row of multiplications above and write the products.

Something to do Make a multiplication table like that on page 59. Fill in all of the empty squares.

Helps in Multiplication

You may be able to do such multiplications as 6×58 in at least three different ways. When using any of the three ways, think of the 58 as 50+8 or as 5 tens and 8 ones. You can do this because 58=50+8. You can multiply, writing each partial product, like this:

$$\begin{array}{lr} & 58 \\ & \times 6 \\ \hline \text{Think: } 6\times 8= & 48 \\ \text{Think: } 6\times 50= & 300 \\ \hline \text{Add} & 348 \end{array}$$

A second way to multiply, in which you remember, rather than write, partial products, is shown.

$$\begin{array}{lr} \text{Think: } 6\times 8=48 \text{ and} & 58 \\ 6\times 50=300.\ 300+48=348. & \times 6 \\ \cline{2-2} \text{Write only the product.} & 348 \end{array}$$

A third way to multiply is to multiply first 6×50 and then 6×8. The partial products, which you remember, not write, are 300 and 48. The product is 348.

$$\begin{array}{lr} \text{Think: } 6\times 50=300 & 58 \\ \qquad\quad 6\times 8=48 & \times 6 \\ \cline{2-2} \text{The product is } 348. & 348 \end{array}$$

Oral Be ready to tell three ways to do each multiplication below.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 81 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 48 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 56 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 93 \\ \times 8 \\ \hline \end{array}$

Look at this set of numbers: 20, 30, 40, 50, 60, 70, 80, 90. Now take each of these numbers in turn and follow the directions given below.

2. Multiply by 6. Add 2 to the product.

3. Multiply by 6. Add 4.

4. Multiply by 7. Add 5.

5. Multiply by 7. Add 6.

6. Multiply by 8. Add 3.

7. Multiply by 8. Add 6.

8. Multiply by 8. Add 7.

9. Multiply by 8. Add 8.

Written Copy the multiplications in row 1 above. Write each product. Then write each exercise in 2 through 9 above in the language of arithmetic, using parentheses to show what you want done first, like this:

$(6\times 20)+2=n \qquad (6\times 30)+4=n$

Solve each of your equations.

Multiplying Hundreds, Tens, and Ones

David bought 2 boxes of pencils for the school store. There were 144 pencils in each box. How many pencils did David buy?

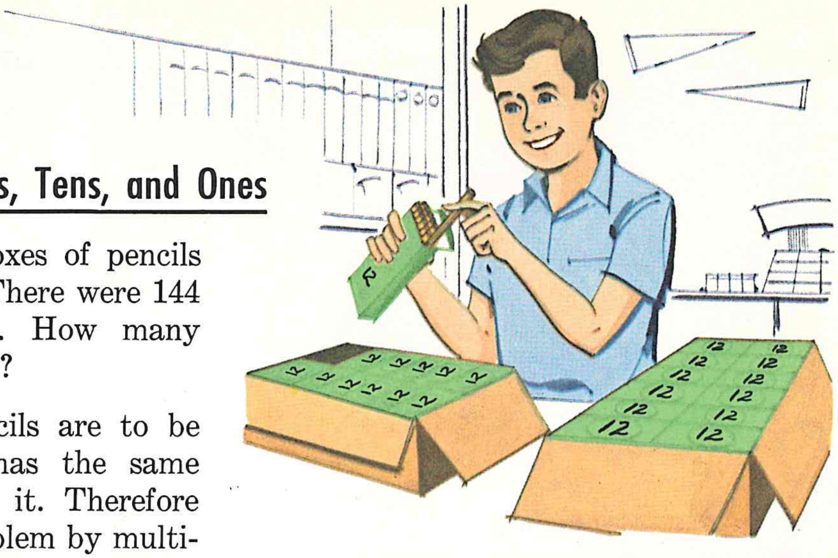
The 2 sets of pencils are to be together. Each set has the same number of pencils in it. Therefore you can solve the problem by multiplying. The equation is 2×144=n.

Before you try to find the product, think of 144 as 100+40+4. Then you can do the multiplication as shown.

	144	
	×2	
2×4=	8	partial product
2×40=	80	partial product
2×100=	200	partial product
Add	288	product

The multiplication can also be done in a grid, as shown.

	H	T	O
	1	4	4
		×	2
2×4 ones=8 O=			8
2×4 tens=8 T=		8	0
2×1 hundred=2 H=	2	0	0
Add	2	8	8



The product is 2 hundreds, 8 tens, and 8 ones or 288. David had 288 pencils.

Oral Be ready to tell the product of each multiplication below.

	a	*b*
1.	2×100=n	5×100=n
2.	3×200=n	2×200=n
3.	4×200=n	2×400=n
4.	2×300=n	9×100=n
5.	8×100=n	6×100=n

Be ready to tell how you would do each of the multiplications below.

	a	*b*	*c*	*d*
6.	132 ×3	244 ×2	423 ×2	222 ×4

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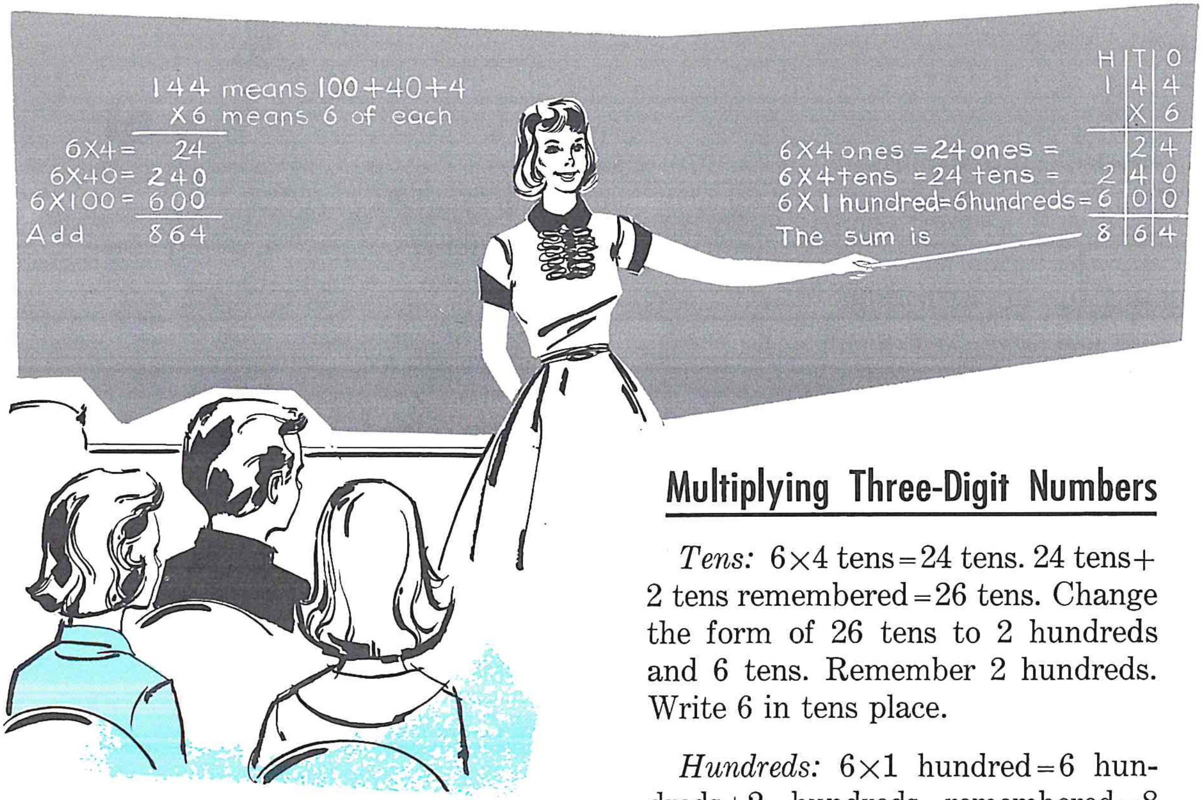
Written Copy rows 1 through 6 above. Find each product.

Multiplying Three-Digit Numbers



The multiplication on the board helps you see how to solve the equation 6×144=n.

You may be able to do the multiplication without writing each partial product. Again you think of 144 as 100+40+4. Then multiply the ones, tens, and hundreds separately.

$$\begin{array}{r} 144 \\ \times 6 \\ \hline 864 \end{array}$$

MORE PRACTICE PAGE 303

Ones: 6×4 ones=24 ones. Change the form of 24 ones to 2 tens and 4 ones. Write 4 in ones place. Remember 2 tens.

Tens: 6×4 tens=24 tens. 24 tens+2 tens remembered=26 tens. Change the form of 26 tens to 2 hundreds and 6 tens. Remember 2 hundreds. Write 6 in tens place.

Hundreds: 6×1 hundred=6 hundreds+2 hundreds remembered=8 hundreds. Write 8 in hundreds place.

The product is 8 hundreds, 6 tens, and 4 ones or 864.

Oral Be ready to tell the steps you would take in doing each multiplication below.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 132 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 244 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 123 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 222 \\ \times 4 \\ \hline \end{array}$
2.	$\begin{array}{r} 435 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 228 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 238 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 298 \\ \times 3 \\ \hline \end{array}$

Written Copy rows 1 and 2 above. Write each product.

Multiplying More Three-Digit Numbers

You can multiply any three-digit number by a one-digit number if you multiply the hundreds, tens, and ones separately to find each partial product. Then you add the partial products. However, each partial product must be written in the correct place-value position. In the multiplication $6 \times 395 = n$, think of 395 as $300+90+5$. Then you can multiply as shown.

$$\begin{array}{lrl} & 395 & \\ & \times 6 & \\ \hline 6\times5= & 30 & \text{partial product} \\ 6\times90= & 540 & \text{partial product} \\ 6\times300= & 1800 & \text{partial product} \\ \hline \text{Add} & 2370 & \end{array}$$

Using the grid may help you do the multiplication.

Th	H	T	O
	3	9	5
		×	6
		3	0
	5	4	0
1	8	0	0
2	3	7	0

		Th	H	T	O
6×5 O=30 O=				3	0
6×9 T=54 T=			5	4	0
6×3 H=18 H=	+	1	8	0	0
The sum is		2	3	7	0

Oral Be ready to explain each multiplication below.

$$\begin{array}{lrr} & a & b \\ \textbf{1.} & \begin{array}{r} 538 \\ \times 4 \\ \hline 32 \\ 120 \\ 2000 \\ \hline 2152 \end{array} & \begin{array}{r} 657 \\ \times 6 \\ \hline 42 \\ 300 \\ 3600 \\ \hline 3942 \end{array} \\ \textbf{2.} & \begin{array}{r} 725 \\ \times 5 \\ \hline 25 \\ 100 \\ 3500 \\ \hline 3625 \end{array} & \begin{array}{r} 895 \\ \times 7 \\ \hline 35 \\ 630 \\ 5600 \\ \hline 6265 \end{array} \end{array}$$

Written Copy. Write each partial product and product. Check by multiplying again.

	a	*b*	*c*	*d*
1.	259 ×2	361 ×5	745 ×4	854 ×8
2.	612 ×6	723 ×3	836 ×7	947 ×9
3.	424 ×6	951 ×9	548 ×7	592 ×3
4.	876 ×6	743 ×9	628 ×3	399 ×7
5.	612 ×6	583 ×9	472 ×3	726 ×5

MORE PRACTICE
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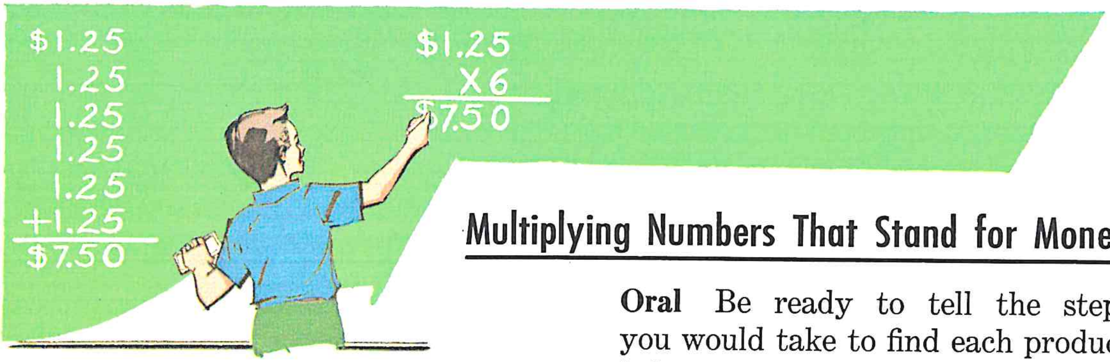


Multiplying Numbers That Stand for Money

You multiply numbers that stand for money in the same way as you multiply other numbers. If you are to multiply \$2.32 by 3, think of \$2.32 as 2 dollars+32 cents and then multiply. 3×2 dollars=6 dollars, and 3×32 cents=96 cents. The product is \$6.96.

You can also do the multiplication as shown below.

$$\begin{array}{lr} & \$2.32 \\ & \times 3 \\ \hline 3\times 2¢= & 6 \\ 3\times 30¢= & 90 \\ 3\times \$2= & 6.00 \\ \hline & \$6.96 \end{array}$$

If you are sure that you know what happens when you multiply, you may use the short form shown. In the short form you keep the signs \$ and . in columns. Then your answer will be written correctly.

$$\begin{array}{r} \$2.32 \\ \times 3 \\ \hline \$6.96 \end{array}$$

Oral Be ready to tell the steps you would take to find each product below.

	a	*b*	*c*	*d*
1.	\$2.44 ×2	\$1.15 ×5	\$3.98 ×7	\$9.85 ×7

Be ready to tell how you would solve each problem below.

2. Marvin's father bought 4 shirts at \$3.95 each. How much did he spend for all the shirts?

3. If Ken puts \$1.50 in his bank each week, how much will he save in 8 weeks?

4. Dick earns \$1.25 each week by running errands. How much does he earn in 7 weeks?

Written Copy. Find each product. Check.

	a	*b*	*c*	*d*
1.	\$9.75 ×2	\$1.09 ×9	\$8.71 ×8	\$6.20 ×4
2.	\$3.84 ×3	\$2.19 ×3	\$1.50 ×5	\$2.79 ×6
3.	\$3.85 ×7	\$6.43 ×3	\$7.22 ×8	\$8.33 ×4

Solving Problems

Read each problem. Decide what it tells and what question it asks. Remember:

a. *Add* the numbers of the sets if the problem question means join unequal groups or sets.

b. *Subtract* the numbers if it means take a group, or set, apart, or compare sets.

c. *Multiply* the numbers if it means join groups, or sets, with the same numbers.

Oral Be ready to tell how you would solve each problem below.

1. Jack Martin's father paid 3 boys each $1.25 to help him clean a vacant lot for a garden. How much did he pay the boys?

2. Mr. Martin bought 24 tomato plants and 48 cabbage plants. How many more cabbage plants than tomato plants did he buy?

3. The 2 dozen tomato plants cost 44¢ a dozen. How much did Mr. Martin pay for the tomato plants?

4. Mr. Martin paid 25¢ for bean seed, 15¢ for carrot seed, 10¢ for radish seed, and 79¢ for a pair of gardening gloves. How much did he spend for these things?

5. Mrs. Martin paid $1.65 each for 3 rosebushes. How much did all of the bushes cost?

6. Jack had $2.40. He paid 15¢ for a package of sunflower seed. How much money did he have left?

7. One day Jane went to the store for her mother. She paid $1.65 for meat, 72¢ for butter, and 21¢ for bread. How much did she spend?

8. Mrs. Martin canned 31 quarts of tomatoes. Later she canned 27 quarts of beans. How many fewer quarts of beans than tomatoes did she can?

Written Write problems 1 through 8 in equation form and solve them. Reminder: Do not include the signs $ and . in equations. They are written only in the final answer to a problem.

Review and Practice

On this page you will find out whether you need help with addition, subtraction, or multiplication.

Part 1 Copy. Find each sum or difference.

	a	*b*	*c*	*d*
1.	96 +7	5 +96	32 +9	7 +94
2.	89 4 5 +3	4 3 2 +96	99 60 70 +19	$.87 .78 .25 +.38
3.	865 +58	840 +70	998 +89	984 +79
4.	316 423 +564	242 548 +130	500 956 +465	711 973 +582
5.	625 860 703 +400	500 753 292 +341	$1.96 5.00 1.27 +1.31	$3.39 4.17 2.08 +.23
6.	9183 721 +345	654 8680 +427	$91.83 .69 +9.95	$42.31 7.11 +1.88
7.	3125 1040 607 +6950	2308 1479 7831 +3456	$60.41 40.02 21.50 +35.37	$19.95 1.85 72.50 +3.00
8.	32 −8	80 −17	90 −81	$.61 −.45
9.	467 −88	528 −99	600 −87	703 −65
10.	800 −278	445 −237	$3.00 −1.35	$4.85 −2.78
11.	4000 −396	3006 −652	$50.10 −9.90	$16.20 −2.59
12.	4896 −2957	7005 −1234	$30.88 −15.90	$48.27 −10.39

Part 2 Copy. Find each product.

	a	*b*	*c*	*d*
1.	91 ×6	72 ×3	90 ×4	80 ×9
2.	16 ×5	18 ×5	24 ×4	47 ×2
3.	98 ×8	37 ×3	87 ×6	42 ×7
4.	374 ×8	833 ×9	278 ×5	593 ×3
5.	$5.74 ×3	$6.20 ×8	$2.83 ×7	$5.33 ×9
6.	$4.16 ×4	$3.86 ×6	$7.80 ×5	$1.98 ×8

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. When you are to think of groups, or sets, that have the same number, as being joined, multiply the number that tells how many in each set by the number that tells how many sets. (57)

2. The multiplicand tells how many in each of the sets to be joined, the multiplier tells how many sets are to be joined, and the product tells how many in all of the sets together. (57)

3. Multiply the digits in tens place, in hundreds place, or in any place-value position exactly as you multiply ones. (62, 68, 69)

Words to Know

1. Multiplicand, multiplier, and product (57)

2. Partial product (62)

Questions to Discuss

1. How can you find the product in a multiplication if you do not remember it? (57, 58, 59, 66)

2. How can you tell whether to use addition or multiplication to solve a problem? (60)

3. What is the product when you multiply 1 by 5? By 6? By 7? (59)

4. What is the product when you multiply 0 by any number? When you multiply any number by 0? (61)

Written Practice

Copy in column form. Write each product.

	a	*b*	
1.	$3 \times 8 = n$	$6 \times 4 = n$	(59)
2.	$5 \times 9 = n$	$8 \times 5 = n$	(59)
3.	$4 \times 60 = n$	$3 \times 90 = n$	(61)
4.	$3 \times 23 = n$	$6 \times 81 = n$	(62)
5.	$5 \times 16 = n$	$4 \times 56 = n$	(63)
6.	$7 \times 6 = n$	$7 \times 9 = n$	(65)
7.	$9 \times 8 = n$	$9 \times 9 = n$	(66)

Copy. Write each product.

	a	*b*	*c*	
8.	$\begin{array}{r}123\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}432\\ \times 2\\ \hline\end{array}$	$\begin{array}{r}241\\ \times 4\\ \hline\end{array}$	(69)
9.	$\begin{array}{r}238\\ \times 2\\ \hline\end{array}$	$\begin{array}{r}143\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}275\\ \times 3\\ \hline\end{array}$	(70)
10.	$\begin{array}{r}\$8.75\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}\$2.98\\ \times 6\\ \hline\end{array}$	$\begin{array}{r}\$6.29\\ \times 9\\ \hline\end{array}$	(72)

Self-Evaluation

Part 1 Copy. Write each product.

	a	*b*	*c*	*d*
1.	9 ×8	6 ×7	5 ×8	7 ×9
2.	8 ×8	7 ×7	7 ×8	9 ×9
3.	6 ×8	9 ×6	8 ×6	9 ×7

Part 2 Copy. Write each product.

	a	*b*	*c*	*d*
1.	32 ×3	42 ×2	90 ×3	82 ×4
2.	75 ×8	96 ×7	58 ×9	83 ×6
3.	321 ×3	346 ×2	930 ×3	812 ×4

Part 3 Copy. Write each sum.

	a	*b*	*c*
1.	9765 +4328	7649 +8539	8407 +7696
2.	5146 3697 +5432	6159 7643 +8954	7898 4769 +4388
3.	9543 8632 7496 +4989	6150 7496 8079 +9005	4387 2496 3879 +6987

Part 4 Copy. Write each difference.

	a	*b*	*c*
1.	8917 −7654	7532 −4369	9096 −3897
2.	7001 −5697	8137 −4869	9000 −7415
3.	6850 −1113	5943 −1004	5320 −1614
4.	7690 −5241	6007 −3248	8558 −6019

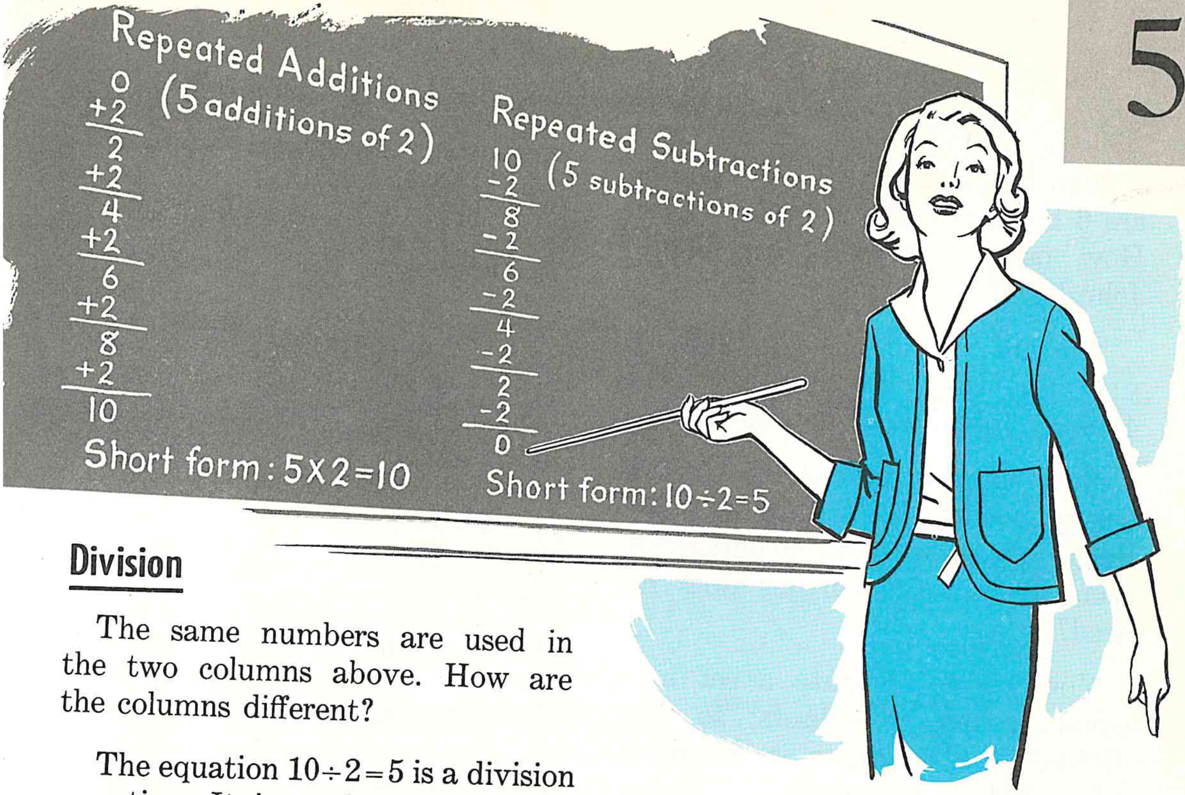
Part 5 Solve these problems.

1. Larry has 8 packages of paper with 48 sheets of paper in each package. How many sheets of paper does he have in all of the packages together?

2. If an airplane flies at a steady rate of 325 miles an hour, how far will it be from its starting point in six hours?

3. There are 695 pupils in the Lincoln School, 487 pupils in the McKinley School, and 364 pupils in the Emerson School. How many pupils are there in all three of the schools?

4. Beverly had $10.00 to spend. She bought a pair of shoes for $5.29. How much money did she have left?



Division

The same numbers are used in the two columns above. How are the columns different?

The equation 10÷2=5 is a division equation. It is read like this: Ten divided by two equals five. 10, the number being divided, is called the **dividend.** 2, the number divided by, is called the **divisor.** 5, the number obtained by dividing, is called the **quotient.**

Look again at the picture at the top of this page. It shows that subtraction undoes what addition does. For this reason subtraction is called the **inverse operation** of addition.

To solve the equation 10÷2=n, you are to find how many 2's are contained in 10. How can you use repeated subtraction to solve the equation 10÷2=n?

Oral Tell how to use repeated addition to find the value of n in the equations in column *a*. Tell how to use repeated subtraction to find the value of n in the equations in column *b*.

	a	*b*
1.	2×3=n	6÷3=n
2.	3×2=n	6÷2=n
3.	2×4=n	8÷4=n
4.	4×2=n	8÷2=n
5.	5×2=n	10÷2=n
6.	2×5=n	10÷5=n

Reviewing Division Through Dividends of 25

John has 4 cartons of pop. There are 6 bottles of pop in each carton. How many bottles of pop does John have?

You are to join equal groups; so you multiply. The equation is $4\times6=n$. John has 24 bottles of pop.

Now suppose that John has 24 empty bottles. He wishes to place them in cartons with 6 bottles in each. How many cartons does he need?

You are to separate a set into equal groups, or subsets; so you divide. The equation is $24\div6=4$. John needs 4 cartons.

6 multiplied by 4 equals 24. Do four 6's (added) equal 24?

Oral Replace each n with a numeral. Use repeated addition for help with column *a*, or repeated subtraction for help with column *b*, if you need help.

	a	*b*
1.	$2\times6=n$	$12\div6=n$
2.	$6\times2=n$	$12\div2=n$
3.	$2\times7=n$	$14\div7=n$
4.	$7\times2=n$	$14\div2=n$
5.	$2\times8=n$	$16\div8=n$
6.	$8\times2=n$	$16\div2=n$
7.	$2\times9=n$	$18\div9=n$
8.	$9\times2=n$	$18\div2=n$
9.	$3\times4=n$	$12\div4=n$
10.	$4\times3=n$	$12\div3=n$
11.	$3\times5=n$	$15\div5=n$
12.	$5\times3=n$	$15\div3=n$
13.	$3\times6=n$	$18\div6=n$
14.	$6\times3=n$	$18\div3=n$
15.	$3\times7=n$	$21\div7=n$
16.	$7\times3=n$	$21\div3=n$
17.	$3\times8=n$	$24\div8=n$
18.	$8\times3=n$	$24\div3=n$
19.	$4\times4=n$	$16\div4=n$
20.	$4\times5=n$	$20\div5=n$
21.	$5\times4=n$	$20\div4=n$
22.	$4\times6=n$	$24\div6=n$
23.	$6\times4=n$	$24\div4=n$
24.	$5\times5=n$	$25\div5=n$

Written Copy. Solve each equation in rows 1 through 24.

Reviewing Division Through Dividends of 45

÷	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

The above table shows all of the whole-number divisions through 45. The strips on the table will help you see how to find the quotient of 30÷6. Do you see that 30÷6=5? Does 30÷5=6?

As you can see on the table, dividing a number by 1 does not change the number.

See what happens when you divide a number by itself: 2÷2=1, 3÷3=1, 4÷4=1. Dividing a number by itself results in a quotient of 1.

Tell the quotient for each of the following: 5÷1, 6÷1, 7÷1, 8÷1, 9÷1.

Now tell the quotient for the following divisions: 5÷5, 6÷6, 7÷7, 8÷8, 9÷9.

Oral Use the light blue part of the table to help you find the quotient for each division below.

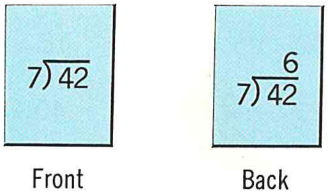
	a	*b*	*c*	*d*
1.	$9\overline{)27}$	$3\overline{)27}$	$7\overline{)28}$	$4\overline{)28}$
2.	$8\overline{)32}$	$4\overline{)32}$	$9\overline{)36}$	$4\overline{)36}$
3.	$8\overline{)40}$	$5\overline{)40}$	$7\overline{)35}$	$5\overline{)35}$
4.	$7\overline{)42}$	$6\overline{)42}$	$9\overline{)45}$	$5\overline{)45}$

Tell the quotient for each division below. Use the table only if you need to.

	a	*b*	*c*	*d*
5.	$6\overline{)24}$	$4\overline{)24}$	$3\overline{)24}$	$8\overline{)24}$
6.	$7\overline{)21}$	$3\overline{)21}$	$6\overline{)18}$	$3\overline{)18}$
7.	$2\overline{)18}$	$9\overline{)18}$	$8\overline{)16}$	$2\overline{)16}$

Written Copy the divisions in rows 1 through 7 above. Write each quotient.

Something to do Make practice cards for the divisions you learned on page 78 and on page 79. Your cards should look like this:



Front Back

Practicing Multiplication and Division

Division will be easy for you if you know multiplication well. Here is how to use multiplication to help you with division.

Look at the dividend, 42, first in a division such as $6\overline{)42}$. Then look at the divisor, 6. Think: $42 = n \times 6$, or 42 = how many 6's to be added? The answer, 7, is the quotient.

Oral Read. Be ready to tell the value of n.

	a	*b*
1.	$24 = n \times 3$	$21 = n \times 3$
2.	$18 = n \times 3$	$4 = n \times 2$
3.	$27 = n \times 9$	$18 = n \times 6$
4.	$25 = n \times 5$	$4 = n \times 4$
5.	$20 = n \times 5$	$35 = n \times 7$
6.	$36 = n \times 9$	$45 = n \times 9$
7.	$16 = n \times 8$	$45 = n \times 5$
8.	$14 = n \times 7$	$12 = n \times 2$
9.	$9 = n \times 3$	$24 = n \times 8$
10.	$32 = n \times 4$	$15 = n \times 3$
11.	$21 = n \times 7$	$40 = n \times 8$
12.	$0 = n \times 7$	$n = 5 \times 0$

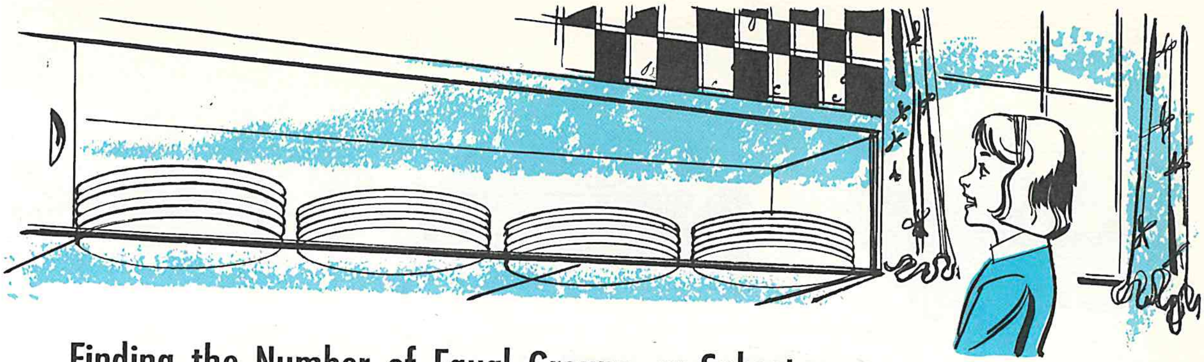
MORE PRACTICE PAGE 304

Written Copy. Write each product.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}9\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}8\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}6\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}9\\ \times 3\\ \hline\end{array}$
2.	$\begin{array}{r}8\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}5\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}9\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}7\\ \times 3\\ \hline\end{array}$
3.	$\begin{array}{r}7\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}8\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}4\\ \times 9\\ \hline\end{array}$	$\begin{array}{r}5\\ \times 8\\ \hline\end{array}$
4.	$\begin{array}{r}4\\ \times 6\\ \hline\end{array}$	$\begin{array}{r}3\\ \times 9\\ \hline\end{array}$	$\begin{array}{r}4\\ \times 7\\ \hline\end{array}$	$\begin{array}{r}5\\ \times 7\\ \hline\end{array}$

Copy. Write each quotient.

	a	*b*	*c*	*d*
5.	$2\overline{)10}$	$2\overline{)12}$	$5\overline{)5}$	$2\overline{)14}$
6.	$4\overline{)12}$	$5\overline{)20}$	$1\overline{)5}$	$5\overline{)30}$
7.	$3\overline{)6}$	$5\overline{)15}$	$4\overline{)20}$	$3\overline{)3}$
8.	$7\overline{)42}$	$4\overline{)4}$	$4\overline{)24}$	$4\overline{)16}$
9.	$9\overline{)36}$	$8\overline{)16}$	$1\overline{)3}$	$4\overline{)32}$
10.	$5\overline{)45}$	$7\overline{)21}$	$3\overline{)12}$	$2\overline{)2}$
11.	$3\overline{)24}$	$1\overline{)4}$	$4\overline{)36}$	$5\overline{)40}$
12.	$3\overline{)15}$	$7\overline{)14}$	$1\overline{)2}$	$9\overline{)18}$
13.	$2\overline{)16}$	$2\overline{)18}$	$3\overline{)18}$	$9\overline{)27}$
14.	$4\overline{)8}$	$9\overline{)45}$	$6\overline{)18}$	$7\overline{)28}$
15.	$2\overline{)8}$	$3\overline{)27}$	$5\overline{)0}$	$7\overline{)0}$



Finding the Number of Equal Groups, or Subsets

Mary had 24 plastic plates which she put on shelves in stacks of 6 plates each. How many stacks of plastic plates did she have?

Mary separated a set into equal groups, or subsets. To find how many groups, you could do one of two things: You could use repeated subtraction, 6 plates at a time, or you could divide.

The better way is to divide. The equation is $24 \div 6 = n$. The value of n is 4. Mary had 4 stacks of plates.

Whenever you can answer the question in a problem by separating a set into equal groups, you can divide the numbers.

Oral Tell the equation you would use in solving each of the following problems.

1. Betty is having a party. She has 18 apples. She wants to give 2 apples to each girl. To how many girls can she give apples?

2. Joan has a ribbon 36 inches long which she wants to cut into 9-inch pieces. How many pieces can she cut?

3. Dick spent 28¢ for 4¢ stamps. How many stamps did he buy?

4. Betty Jo and her mother made 24 sandwiches for a party. If they put 4 sandwiches on a plate, how many plates did they need?

5. Roger has 45 pounds of onions. He plans to put the onions into bags of 5 pounds each. How many bags of onions can he fill?

Written Write an equation for problems 1 through 5 above. Find the value of n in each equation.

Something to do Make problems of your own which can be solved by using these equations:

	a	*b*
1.	$32 \div 8 = n$	$16 \div 4 = n$
2.	$45 \div 9 = n$	$36 \div 4 = n$

Finding How Many in Each Equal Group, or Subset

Mary had 12 place cards. She planned to put them on 3 tables with the same number of place cards on each table. How many place cards should she put on each table?

The problem could be solved by taking the group, or set, of 12 apart by removing 1 place card at a time, placing 1 card at a time at each of 3 tables. The rearranging would end when all 12 place cards were on tables.

The arrangement might be shown like this:

Place Cards

one	two	three	four	
X	X	X	X	1st table
X	X	X	X	2nd table
X	X	X	X	3rd table

There are 4 place cards on each table.

In the problem on this page you know that 3 subsets were made from a set of 12. You do not know how many place cards are in each set.

You can find out by using the equation $3 \times n = 12$. But because the problem is one of separating a collection into equal groups, or subsets, it is considered a division problem. The equation is usually written $12 \div 3 = n$.

Oral Tell the equation you would use in solving each of the following problems. Also tell how you know that you should divide, not subtract.

1. Betty put 24 cookies into a box. She put them in 4 equal rows. How many cookies were there in each row?

2. George had 42 pigeons. He wanted to put the same number in each of 6 cages. How many pigeons should be put into each cage?

3. Roy paid 40¢ for 5 grapefruit. How much did each grapefruit cost?

4. Bob set out 24 tomato plants in 4 rows with the same number of plants in each row. How many plants were in each row?

5. Ann had a piece of yarn that was 24 feet long to cut into 6 pieces that were equal in length. How long should each piece be?

Written For each problem below write D-1 if you are to find the number of equal groups. Write D-2 if you are to find how many in each equal group. Solve each problem.

1. Mary had 45 pennies. She put them into stacks of 5 pennies each. How many stacks of pennies did she make?

2. Bob has 42 eggs. He wants to put all of them into 7 boxes with the same number of eggs in each box. How many eggs will he put into each of the 7 boxes?

3. The 36 children are to ride in 9 cars as they go to the park. How many children should ride in each car if each car takes the same number of children?

4. The boys have 40 chairs to arrange in 5 rows with the same number of chairs in each row. How many chairs should they put in each row?

5. Sue and her mother have made 32 sandwiches for a party. If they place 4 sandwiches into each sandwich bag, how many sandwich bags do they need?

6. Alice has 35¢ to spend for ice cream cones at 7¢ each. How many ice cream cones can she buy?

7. There are 45 children in a cafeteria. They are to sit at 9 tables with the same number of children at each table. How many children should sit at each table?

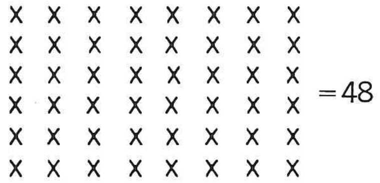
A quick review

	a	*b*
1.	$29+9=n$	$45+8=n$
2.	$67+79=n$	$85+96=n$
3.	$19+99=n$	$38+95=n$
4.	$185+101=n$	$975+125=n$
5.	$600+399=n$	$898+898=n$
6.	$31-9=n$	$43-8=n$
7.	$67-28=n$	$81-49=n$
8.	$65-47=n$	$90-18=n$
9.	$399-195=n$	$690-399=n$
10.	$500-295=n$	$901-675=n$
11.	$4\times70=n$	$5\times95=n$
12.	$7\times62=n$	$9\times28=n$
13.	$6\times26=n$	$3\times77=n$
14.	$5\times38=n$	$8\times17=n$
15.	$6\times66=n$	$9\times42=n$

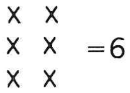
Using 6 in Division

The boys have 48 chairs to set up around tables. They can place 6 chairs at each table. How many tables do they need?

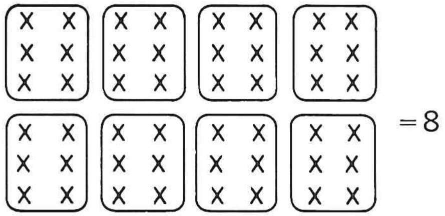
The boys are to rearrange 48 chairs into equal groups of 6. Look at the picture below. Begin with 48 chairs:



Separate into groups of 6 chairs each:



You have:



There are 8 groups of 6 chairs each. Is 6 contained in 48 eight times? Does 48÷6=8?

Suppose the boys had divided the chairs into groups of 8 chairs each, with 8 chairs around each table. They would have needed only 6 tables. Is 8 contained in 48 six times? Does 48÷8=6?

Try dividing 54 into 9's and then into 6's. Did you discover that 54÷9=6 and 54÷6=9?

Oral All of the divisions for 6 except 36÷6=6 are given below. Cover the quotients in each row. See how quickly you can say each quotient. Make practice cards if necessary.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}6\\1\overline{)6}\end{array}$	$\begin{array}{r}1\\6\overline{)6}\end{array}$	$\begin{array}{r}2\\6\overline{)12}\end{array}$	$\begin{array}{r}6\\2\overline{)12}\end{array}$
2.	$\begin{array}{r}6\\3\overline{)18}\end{array}$	$\begin{array}{r}3\\6\overline{)18}\end{array}$	$\begin{array}{r}6\\4\overline{)24}\end{array}$	$\begin{array}{r}4\\6\overline{)24}\end{array}$
3.	$\begin{array}{r}6\\5\overline{)30}\end{array}$	$\begin{array}{r}5\\6\overline{)30}\end{array}$	$\begin{array}{r}7\\6\overline{)42}\end{array}$	$\begin{array}{r}6\\7\overline{)42}\end{array}$
4.	$\begin{array}{r}8\\6\overline{)48}\end{array}$	$\begin{array}{r}6\\8\overline{)48}\end{array}$	$\begin{array}{r}9\\6\overline{)54}\end{array}$	$\begin{array}{r}6\\9\overline{)54}\end{array}$

Written Copy. Write each quotient.

	a	*b*	*c*	*d*
1.	$6\overline{)36}$	$2\overline{)12}$	$6\overline{)42}$	$8\overline{)48}$
2.	$6\overline{)24}$	$6\overline{)48}$	$6\overline{)6}$	$9\overline{)54}$
3.	$6\overline{)54}$	$7\overline{)42}$	$6\overline{)30}$	$3\overline{)18}$
4.	$1\overline{)6}$	$2\overline{)14}$	$4\overline{)24}$	$6\overline{)18}$
5.	$5\overline{)30}$	$9\overline{)45}$	$8\overline{)32}$	$7\overline{)28}$
6.	$4\overline{)32}$	$5\overline{)25}$	$4\overline{)36}$	$3\overline{)27}$
7.	$5\overline{)45}$	$3\overline{)24}$	$4\overline{)28}$	$5\overline{)40}$

Using 7 in Division

Betty Jane made the table below. The row across from 7 was filled in by doing skip-counting by 7's. How was the column below 7 filled in? How many 7's are contained in 49? In 56? In 63?

×/÷	1	2	3	4	5	6	7	8	9
1							7		
2							14		
3							21		
4							28		
5							35		
6							42		
7	7	14	21	28	35	42	49	56	63
8							56		
9							63		

How would you use the table to check each multiplication and division below?

$7 \times 7 = 49$ $\qquad$ $49 \div 7 = 7$

$\begin{array}{r} 7 \\ \times 8 \\ \hline 56 \end{array} \quad \begin{array}{r} 8 \\ \times 7 \\ \hline 56 \end{array}$ $\qquad$ $56 \div 7 = 8$; $56 \div 8 = 7$

$\begin{array}{r} 7 \\ \times 9 \\ \hline 63 \end{array} \quad \begin{array}{r} 9 \\ \times 7 \\ \hline 63 \end{array}$ $\qquad$ $63 \div 7 = 9$; $63 \div 9 = 7$

How many division facts are related to 7×7? To 8×7? To 9×7?

Oral Read each equation, replacing n with the missing numeral.

	a	*b*
1.	$7 \div 1 = n$	$35 \div 5 = n$
2.	$7 \div 7 = n$	$35 \div 7 = n$
3.	$14 \div 2 = n$	$42 \div 6 = n$
4.	$14 \div 7 = n$	$42 \div 7 = n$
5.	$21 \div 3 = n$	$56 \div 8 = n$
6.	$21 \div 7 = n$	$56 \div 7 = n$
7.	$28 \div 4 = n$	$63 \div 9 = n$
8.	$28 \div 7 = n$	$63 \div 7 = n$

Written Copy. Write each quotient.

	a	*b*	*c*	*d*
1.	$3\overline{)24}$	$6\overline{)36}$	$7\overline{)35}$	$4\overline{)28}$
2.	$8\overline{)40}$	$6\overline{)30}$	$7\overline{)49}$	$9\overline{)45}$
3.	$9\overline{)54}$	$8\overline{)16}$	$9\overline{)36}$	$9\overline{)27}$
4.	$6\overline{)24}$	$8\overline{)32}$	$6\overline{)48}$	$7\overline{)21}$
5.	$8\overline{)24}$	$7\overline{)63}$	$5\overline{)35}$	$9\overline{)18}$
6.	$4\overline{)32}$	$3\overline{)27}$	$6\overline{)18}$	$4\overline{)24}$

Something to do You will need to know all of the division facts for 7. Make division practice cards if you need more practice.

MORE PRACTICE PAGE 304

Using 8 in Division

Richard has 72 marbles which he wants to divide into equal groups, with 8 marbles in each set. How many equal groups of 8 marbles will he have?

The marbles will be rearranged into equal groups. You can find how many equal groups by dividing the marbles into sets. Think: 72=n×8. 72=9×8. Therefore n=9 and 72÷8=9.

Suppose the marbles were to be put into groups of 9 marbles each, and you wanted to find how many equal groups. Then you would divide like this: 72÷9=n. 8×9=72 and 72÷9=8. n=8.

Oral Some of the divisions for 8 are given below. See how quickly you can say each quotient. Make practice cards if necessary.

	a	*b*	*c*	*d*
1.	5)40	8)40	6)48	8)48
2.	7)56	8)56	9)63	7)63

Written Copy. Write each quotient.

	a	*b*	*c*	*d*
1.	3)6	1)5	3)3	2)4
2.	9)36	8)72	9)63	7)56
3.	9)45	8)32	6)42	7)35
4.	2)6	3)21	3)12	2)14
5.	8)40	9)54	8)64	9)72
6.	8)48	7)63	6)54	7)49

A quick review

	a	*b*
1.	$(35+7)-4=n$	$29+(88-2)=n$
2.	$(67+75)-2=n$	$3+(99-14)=n$
3.	$8\times(6+8)=n$	$7\times(8+3)=n$
4.	$(8\times5)+60=n$	$(6\times8)-12=n$
5.	$9\times(5+4)=n$	$(5\times9)+21=n$

Can you do this? Find the value of n in each equation below.

	a	*b*
1.	$(3\times7)-n=18$	$2\times(3+n)=16$
2.	$(n\times5)-4=31$	$n\times(5+4)=72$
3.	$(7\times6)-n=20$	$n\times(15-6)=63$
4.	$n\div(3\times3)=8$	$7\times(n-5)=42$

Using 9 in Division

When dividing by 9, there is only one division fact that has a quotient of 9. If you begin with 81 objects and rearrange them into groups of 9, you will have 9 groups. 9×9=81. 81÷9=9.

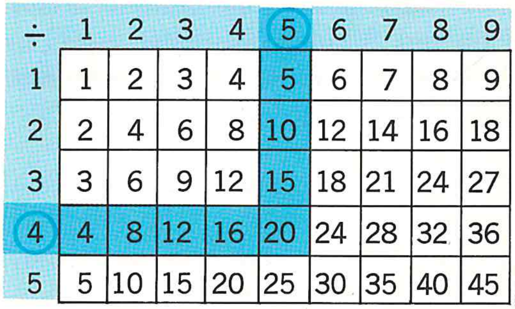
Oral Some of the other division facts for 9 are given below. Cover the quotients in each column. See how quickly you can say each one. Make practice cards if necessary.

	a	*b*
1.	54÷6=9	54÷9=6
2.	63÷7=9	63÷9=7
3.	72÷8=9	72÷9=8
4.	45÷5=9	45÷9=5
5.	36÷4=9	9÷9=1

Written Copy, using the sign)‾‾. Write each quotient.

	a	*b*
1.	18÷2=n	45÷5=n
2.	16÷8=n	64÷8=n
3.	9÷1=n	18÷9=n
4.	32÷4=n	24÷3=n
5.	27÷3=n	45÷9=n
6.	24÷8=n	63÷9=n
7.	63÷7=n	27÷9=n
8.	36÷4=n	8÷8=n
9.	16÷2=n	36÷9=n
10.	63÷9=n	32÷8=n
11.	40÷5=n	72÷8=n
12.	54÷6=n	40÷8=n
13.	56÷7=n	54÷9=n
14.	63÷7=n	56÷8=n
15.	48÷8=n	81÷9=n
16.	72÷9=n	48÷6=n

Something to do Make a division table showing all division facts through divisors of 9. Part of such a table is shown below. The strips will help you see how to use it.



÷	1	2	3	4	⑤	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
④	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45

MORE PRACTICE
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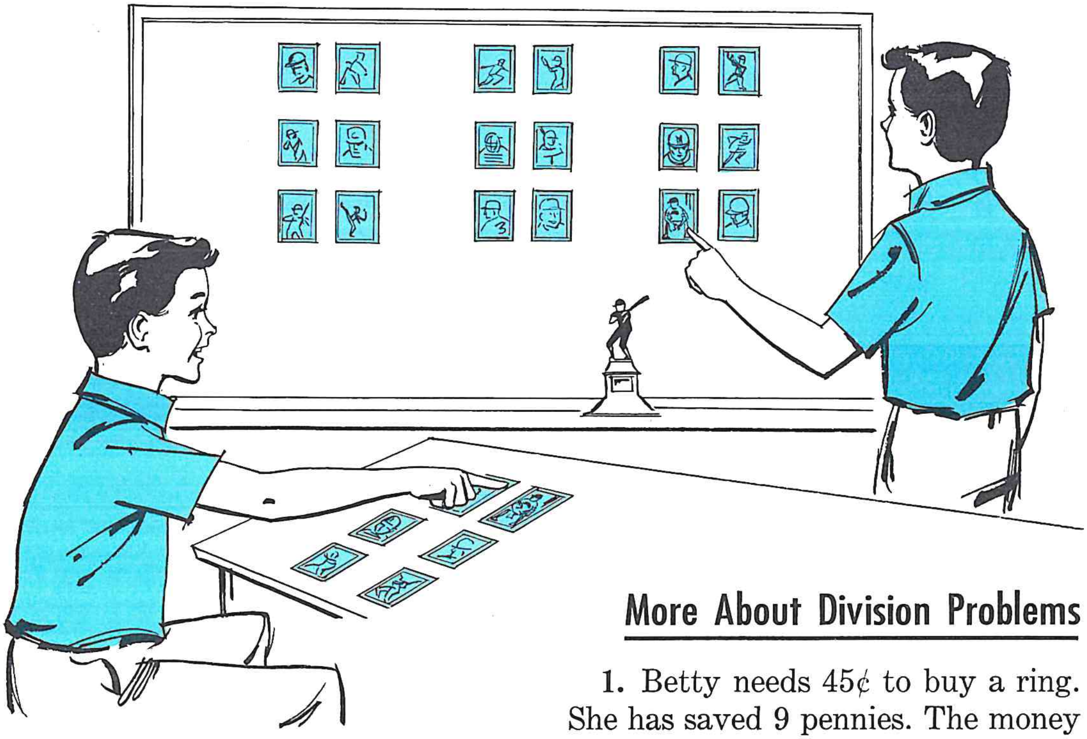

More About Division Problems

Bob has 18 picture cards of baseball players. Carl has 6 picture cards. How many times as many picture cards has Bob as Carl?

The problem could be solved by taking the group, or set, of 18 cards apart, 6 cards at a time. Thus you can divide the numbers. The equation is $18 \div 6 = n$. The value of n is 3. Bob has 3 times as many cards as Carl. For every 3 cards that Bob has, Carl has only 1 card.

Oral Tell the equation you would use in solving each of the following problems. Also tell how you know that you should divide.

1. Betty needs 45¢ to buy a ring. She has saved 9 pennies. The money that she needs is how many times more than the money she has?

2. Laura has a collection of 63 butterflies. Doris has a collection of only 7 butterflies. How many times as many butterflies has Laura as Doris?

3. Donald needs 48 bottles of pop for a party. He has 6 bottles of pop. The bottles that he needs are how many times more than the bottles he has?

4. Mary Jo has made 81 favors for a party. Ann has made only 9 favors. How many times as many party favors were made by Mary Jo as by Ann?

5. Laura has 56 paper plates in one package and only 8 paper plates in another. How many times as many paper plates are in the big package as in the smaller package?

Written For each problem below write D-1 if you are to find the number of equal groups. Write D-2 if you are to find how many in each equal group. Write D-3 if you are to find by how many times one number is greater than another. Write M if you are to multiply. Solve each problem.

1. John has 72 picture cards of baseball players. He wants to arrange them on pages with 8 cards on a page. How many pages will he fill with picture cards?

2. Laura has 64 pennies and Janet has only 8 pennies. How many times as much money does Laura have as Janet?

3. Mary wants to make 9 piles of tickets with 45 in each pile. How many tickets does she need?

4. Betty has made a batch of 54 cookies. She plans to share them equally among 9 girls. How many cookies will each of the girls receive?

5. 6 bus loads of children visited a zoo. Each bus carried 42 children. How many children did all 6 buses carry?

6. Ronnie has 48 eggs. He plans to put them into boxes with 6 eggs in each box. How many boxes does he need?

7. Sally has 63 books in her library. Betty has 9. Sally has how many times as many books as Betty?

8. Margaret bought 6 boxes of pencils for the school store. Each box held 72 pencils. How many pencils did Margaret buy for the store?

9. Betty has 81 pieces of candy to share equally among 9 girls. How many pieces of candy should she give to each girl?

10. A class of 35 children is planning a trip by automobile. If 5 children can ride in each automobile, how many cars are needed for the trip?

Solve each equation below.

	a	*b*
11.	$9\times7=n$	$8\times9=n$
12.	$9\times9=n$	$8\times8=n$
13.	$(9\times8)+20=n$	$(6\times9)-10=n$
14.	$7\times(6+6)=n$	$(7\times6)+6=n$
15.	$(9\times6)+50=n$	$(9\times5)-20=n$
16.	$27-(3\times6)=n$	$15+(6\times9)=n$
17.	$9\times(8\times8)=n$	$(8\times9)+12=n$

Division with a Remainder Other Than Zero

Use repeated subtractions to find the value of n in each of these equations: 12÷2=n, 12÷3=n, 12÷4=n, 12÷6=n. What is the final remainder in each subtraction?

Now see what happens when you use repeated subtraction to find the value of n in the equation 12÷5=n. In the final subtraction, the difference between 7 and 5 is 2. 2 is called a **remainder.**

$$\begin{array}{r} 12 \\ -5 \\ \hline 7 \\ -5 \\ \hline 2 \end{array}$$

What is the remainder when you divide 12 by 7? By 8? By 9?

12 is **divisible** by 2, 3, 4, and 6 because the remainder is 0. Is 12 also divisible by 1 and by 12? A number is said to be divisible by another number only if there is a zero remainder. Is 10 divisible by 2? By 5? By 3?

Any even number, such as 2, 4, 6, and 8, is called a **multiple** of 2 because it is divisible by 2. Any odd number, such as 1, 3, 5, and 7, is not divisible by 2.

MORE PRACTICE
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To find the quotient of 11÷2=n, you can use the following steps.

Divide: Think: 11 is not a multiple of 2. Try 10. 10 is the multiple of 2 smaller than, but closest to, 11 that is divisible by 2. 10÷2=5. Write 5 as the quotient.

Multiply: 5×2=10. Write 10 underneath 11. Draw a line underneath 10 to show that the division is finished.

$$\begin{array}{r} 5\text{ r}1 \\ 2\overline{)11} \\ -10 \\ \hline 1 \end{array}$$

Subtract: 11−10=1. Write 1. The answer is 5, *remainder 1*, or *5 r1.*

2 is contained in 11 five times, and there is a remainder of 1.

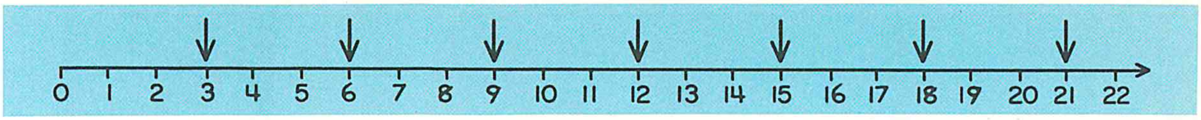
Oral Tell which of the numbers below are divisible by 2.

	a	*b*	*c*	*d*
1.	3	5	8	7
2.	18	15	14	9

Tell how to do these divisions.

	a	*b*	*c*	*d*
3.	$2\overline{)3}$	$2\overline{)5}$	$2\overline{)7}$	$2\overline{)9}$
4.	$2\overline{)11}$	$2\overline{)13}$	$2\overline{)15}$	$2\overline{)17}$
5.	$2\overline{)14}$	$2\overline{)16}$	$2\overline{)19}$	$2\overline{)12}$

Written Copy the divisions in rows 3, 4, and 5 above. Number your rows 1, 2, and 3. Find each quotient and remainder.



Division with a Remainder—Divisor of 3

The above picture has arrows that point to the numerals for numbers that are divisible by 3. Thus 3, 6, 9, and 12 are some of these numbers.

The numbers which are divisible by 3 can be obtained by multiplying some number by 3. Thus $3\times1=3$, $3\times2=6$, $3\times3=9$, $3\times4=12$.

3, 6, 9, 12, and other numbers obtained by skip-counting by 3 are called multiples of 3. The multiples of a number are divisible by that number. Think of some of the other multiples of 3. Is each one divisible by 3?

The steps to use in solving the equation $17\div3=n$ are shown below. Use the example to help you see what they are.

$$\begin{array}{r} 5\ \text{r}2 \\ 3\overline{)17} \\ -15 \\ \hline 2 \end{array}$$

Divide: Think: 17 is not a multiple of 3. Which multiple of 3 is closest to but less than 17? It is 15. Divide 15 by 3. $15\div3=5$. Write 5 in the quotient above 7. Why?

Multiply: $5\times3=15$. Write 15 underneath 17. Why is a line drawn underneath 15?

Subtract: $17-15=2$. Write 2 below 5, to show the difference between 17 and 15. 3 is contained in 17 five times, and the remainder is 2. The answer is 5, remainder 2, or 5 r2.

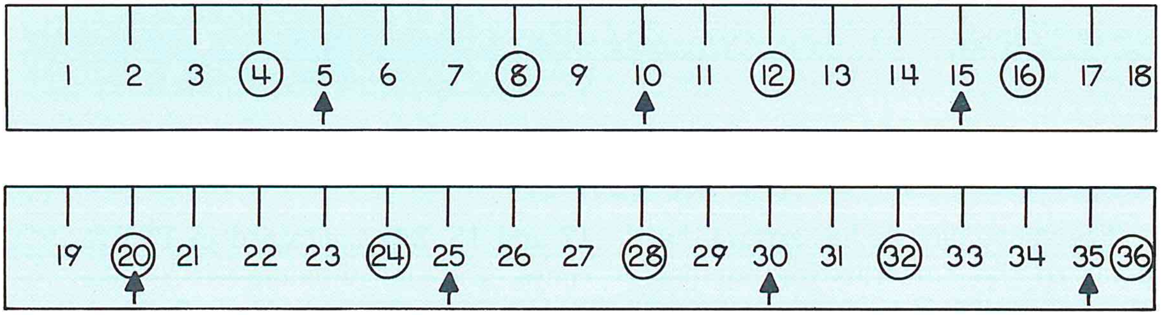
Oral Read each of the following equations and tell the number smaller than, but closest to, the dividend that is divisible by 3.

	a	*b*
1.	$11\div3=n$	$16\div3=n$
2.	$19\div3=n$	$5\div3=n$
3.	$10\div3=n$	$8\div3=n$
4.	$4\div3=n$	$25\div3=n$
5.	$26\div3=n$	$23\div3=n$
6.	$17\div3=n$	$20\div3=n$

Written Write each division in rows 1 through 6 above, using the sign $\overline{)\quad}$. Find the quotient and remainder in each one.

A quick review

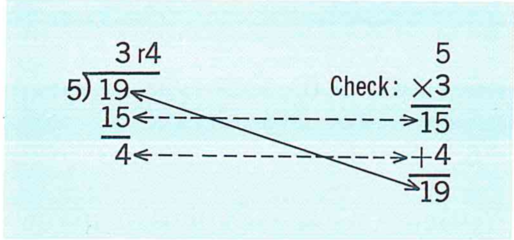
	a	*b*	*c*	*d*
1.	$4\overline{)16}$	$4\overline{)32}$	$4\overline{)8}$	$4\overline{)12}$
2.	$4\overline{)4}$	$4\overline{)24}$	$4\overline{)16}$	$4\overline{)20}$
3.	$5\overline{)25}$	$5\overline{)5}$	$5\overline{)20}$	$5\overline{)10}$



A Remainder Other Than Zero—Divisors of 4 or 5

In the picture above the numerals with circles around them name multiples of 4. They are divisible by 4. How are the multiples of 5 shown?

You can use multiplication and addition to check division. The equation 19÷5=n and its check are shown below.



In the check, multiply the divisor by the quotient and add the remainder to the product.

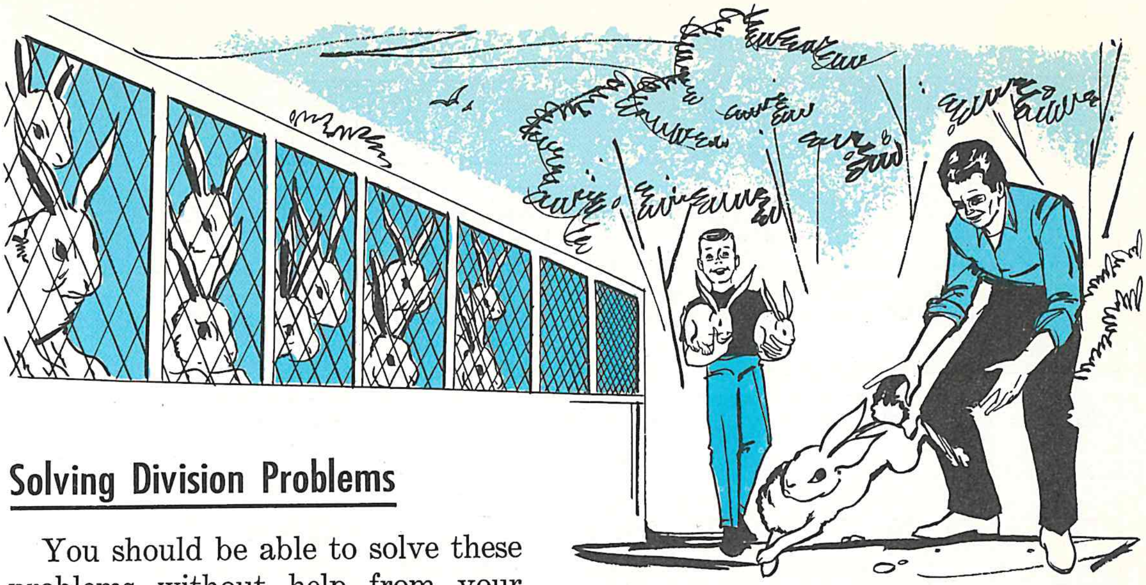
Oral Tell the number smaller than, but closest to, the dividend that is divisible by the divisor.

	a	*b*	*c*	*d*
1.	4)25	4)22	4)18	4)26
2.	4)33	4)21	4)35	4)37
3.	4)29	4)15	4)38	4)39
4.	4)7	4)9	4)10	4)11
5.	4)13	4)27	4)23	4)17
6.	4)19	4)34	4)14	4)30
7.	5)29	5)32	5)19	5)23
8.	5)21	5)16	5)37	5)44

Written Copy each division in rows 1 through 8 above. Find each answer. Check by using multiplication and addition.

A quick review

	a	*b*	*c*	*d*
1.	6)42	6)54	6)24	6)48
2.	6)36	6)18	6)12	6)30
3.	7)42	7)49	7)35	7)21
4.	7)14	7)63	7)28	7)56
5.	8)72	8)48	8)40	8)16



Solving Division Problems

You should be able to solve these problems without help from your teacher.

Read each problem. Pay special attention to the question. In each one you are to separate a group, or set, into a number of equal groups, or subsets, and so you divide.

1. Diane has 19 storybook dolls. She wants to put the same number on each of 3 shelves. How many can she put on each shelf, and how many will be left?

2. Paul wants to make some shelves 3 feet long. How many shelves can he cut from a board 16 feet long? How many feet would be left?

3. Mary's mother made 8 glasses of lemonade for 3 girls. Each girl drank the same number of glasses. How many glasses did each one have, and how many were left over?

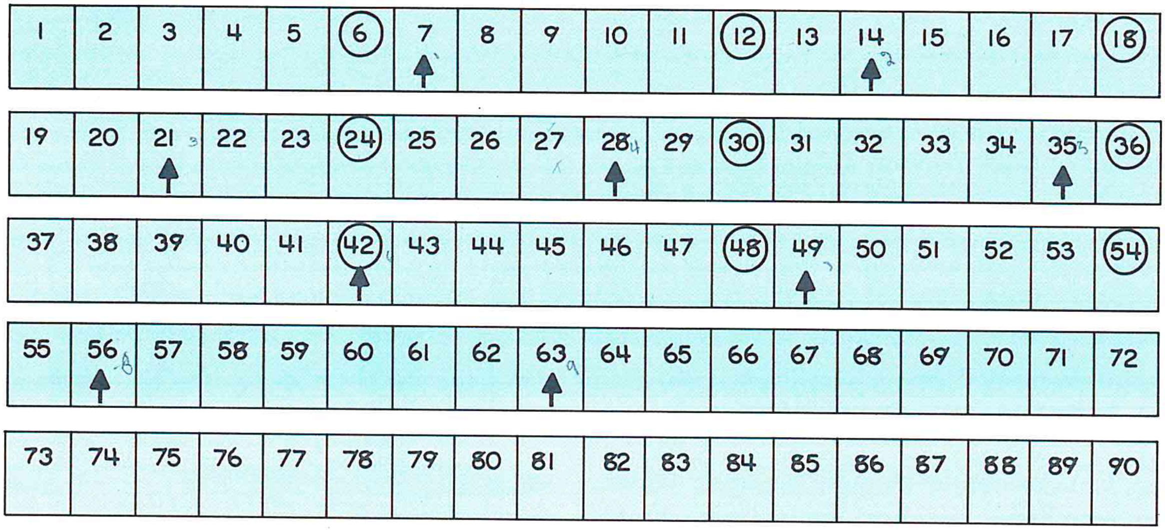
4. Mrs. Brown had a piece of shelf paper 27 feet long. She cut it into 5-foot lengths. How many pieces did she get, and how much was left?

5. Jerry had 25¢ to spend for pencils at 4¢ each. How many pencils could he buy? How much money would he have left?

6. Alice had 19 cookies to serve to the 4 girls at her party. If each girl gets the same number of cookies, how many will each get, and how many will be left?

7. Ken's father wishes to separate his 13 rabbits into pairs. How many pairs of rabbits will he have, and how many rabbits will be left?

8. Allen had 15 apples. He eats 2 each day. How many days will they last, and how many will be left over?



More Division with a Remainder Other Than Zero

In the picture each numeral in a circle names a multiple of 6. Each numeral with an arrow below it names a multiple of 7.

If you do skip-counting by 8, you will name the numbers that are multiples of 8.

How can you find the numbers that are multiples of 9?

Oral Tell the multiple smaller than, but closest to, the dividend that is divisible by the divisor in each of the following divisions. Use the picture above as a help.

	a	*b*	*c*	*d*
1.	$8\overline{)31}$	$9\overline{)34}$	$4\overline{)25}$	$8\overline{)45}$
2.	$6\overline{)28}$	$6\overline{)17}$	$7\overline{)32}$	$9\overline{)21}$
3.	$7\overline{)36}$	$6\overline{)33}$	$7\overline{)43}$	$5\overline{)41}$
4.	$7\overline{)22}$	$9\overline{)42}$	$8\overline{)38}$	$6\overline{)9}$
5.	$8\overline{)76}$	$6\overline{)57}$	$6\overline{)52}$	$7\overline{)64}$
6.	$6\overline{)19}$	$9\overline{)50}$	$8\overline{)23}$	$7\overline{)16}$
7.	$9\overline{)28}$	$7\overline{)29}$	$9\overline{)70}$	$9\overline{)73}$
8.	$8\overline{)54}$	$7\overline{)27}$	$6\overline{)13}$	$6\overline{)22}$
9.	$8\overline{)65}$	$9\overline{)55}$	$9\overline{)82}$	$7\overline{)60}$
10.	$6\overline{)37}$	$6\overline{)45}$	$8\overline{)58}$	$7\overline{)53}$
11.	$6\overline{)11}$	$8\overline{)27}$	$7\overline{)38}$	$5\overline{)13}$
12.	$5\overline{)17}$	$9\overline{)33}$	$6\overline{)34}$	$4\overline{)31}$

Written Copy each division above and divide. Check each quotient.

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. The dividend tells how many in the set to be separated, or divided; the divisor is the number to divide by; the quotient is the number you get by dividing. (77)

2. To find how many equal groups, or subsets, you can make from a larger group, or set, divide the numbers of the sets. (81)

3. To find how many in a group, or set, when you separate a set into equal subsets, divide the numbers of the sets. (82)

4. Whenever the remainder is a number other than zero, it is written at the right of the quotient. (90)

Words to Know

1. Divide, division, divisor, dividend, inverse operation, quotient (77)

2. Divisible, remainder (90)

3. Multiple (90)

Questions to Discuss

1. How might you rearrange a set of 12 objects into sets of 4 objects each? How could you find the number of sets you had made? (77, 81)

2. How might you rearrange a set of 12 objects into 4 smaller sets? How could you find how many in each smaller set? (78, 82)

3. How can you find the quotient in a division in case you forget it? (78, 79)

4. How can you decide whether or not to divide the numbers of the sets in order to solve a problem? (81, 82)

5. How do you decide which number to divide by 3 in the division $3\overline{)20}$? (91)

6. How do you check a division that has a remainder other than zero? (92)

Written Practice

Copy. Write each quotient.

	a	*b*	*c*	*d*	
1.	$6\overline{)42}$	$6\overline{)54}$	$6\overline{)48}$	$6\overline{)36}$	(84)
2.	$7\overline{)49}$	$7\overline{)42}$	$7\overline{)56}$	$7\overline{)63}$	(85)
3.	$8\overline{)56}$	$8\overline{)72}$	$8\overline{)48}$	$8\overline{)64}$	(86)
4.	$9\overline{)54}$	$9\overline{)81}$	$9\overline{)72}$	$9\overline{)63}$	(87)
5.	$3\overline{)19}$	$3\overline{)26}$	$4\overline{)21}$	$5\overline{)39}$	(92)
6.	$6\overline{)35}$	$7\overline{)47}$	$9\overline{)61}$	$8\overline{)59}$	(94)

Self-Evaluation

Part 1 Copy. Write each quotient.

	a	*b*	*c*	*d*
1.	$5\overline{)45}$	$8\overline{)72}$	$7\overline{)35}$	$6\overline{)30}$
2.	$5\overline{)25}$	$9\overline{)45}$	$9\overline{)81}$	$7\overline{)49}$
3.	$6\overline{)42}$	$5\overline{)35}$	$9\overline{)54}$	$8\overline{)48}$
4.	$6\overline{)36}$	$7\overline{)42}$	$8\overline{)40}$	$9\overline{)63}$
5.	$8\overline{)56}$	$5\overline{)40}$	$6\overline{)48}$	$9\overline{)72}$
6.	$3\overline{)28}$	$5\overline{)37}$	$4\overline{)19}$	$6\overline{)41}$
7.	$7\overline{)61}$	$9\overline{)44}$	$8\overline{)29}$	$6\overline{)37}$
8.	$5\overline{)39}$	$6\overline{)50}$	$7\overline{)47}$	$9\overline{)70}$

Part 2 Copy. Write each sum, difference, or product.

	a	*b*	*c*
1.	9759 4683 2754 +1932	6975 3005 2846 +9875	8090 7645 8950 +7250
2.	6915 −4326	7980 −4325	7018 −5695
3.	8110 −5675	9010 −8525	6320 −3595
4.	775 ×3	896 ×6	985 ×7
5.	640 ×8	538 ×9	998 ×5

Part 3 Solve each problem.

1. A milkman delivered 8 cases of milk with 24 bottles in each case. How many bottles did he deliver?

2. Mary spent $12.98 for a dress and $19.50 for a coat. How much more did she spend for the coat than for the dress?

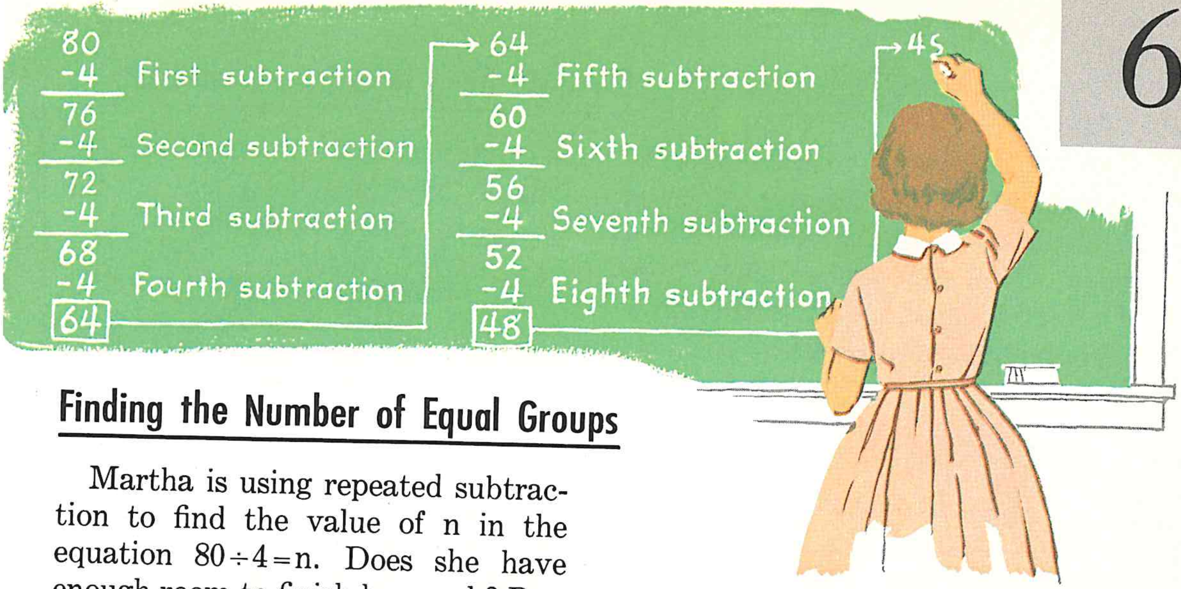
3. Ann has 36 pieces of candy. She wants to share the candy among 5 girls, giving each girl the same number of pieces. How many pieces should she give each girl, and how many pieces will be left?

Part 4 Copy each example below, writing *b* below *a*, *c* below *b*, and *d* below *c*. Write each sum, difference, product, or quotient.

a	*b*	*c*	*d*
345 +689	5720 −3159	385 ×7	$3\overline{)29}$

Beside each numeral of your completed examples write a word telling what to call it. Choose from the words below.

product
quotient
remainder
subtrahend
multiplicand
divisor
sum
minuend
multiplier
difference
addend
dividend



Finding the Number of Equal Groups

Martha is using repeated subtraction to find the value of n in the equation $80 \div 4 = n$. Does she have enough room to finish her work? Perhaps you can finish the subtractions. If you do, you will find that the twentieth subtraction will give you a remainder of 0. Do you see that twenty groups of 4 each are contained in a group of 80?

You could use repeated subtraction to find how many groups of 4 each are contained in a group of 80, but you would get very tired of making so many subtractions, wouldn't you?

Oral Tell how many repeated subtractions you would use to answer each question below. Then solve each equation.

1. How many groups of 2 are contained in a group of 20? $n \times 2 = 20$.
2. How many groups of 3 are contained in a group of 60? $n \times 3 = 60$.
3. How many groups of 4 are contained in a group of 40? $n \times 4 = 40$.
4. How many groups of 2 are contained in a group of 40? $n \times 2 = 40$.
5. How many groups of 2 are contained in a group of 60? $n \times 2 = 60$.

Written Copy. Solve each equation.

	a	*b*
1.	$n \times 2 = 50$	$2 \times n = 50$
2.	$n \times 5 = 50$	$5 \times n = 50$
3.	$n \times 11 = 55$	$n \times 2 = 60$
4.	$n \times 4 = 60$	$n \times 5 = 60$
5.	$n \times 7 = 70$	$n \times 2 = 70$

Can you do this? Think of more than one way to answer questions 1 through 5 of the oral exercise.

Dividing Tens in a Two-Digit Number

It is much easier and faster to use division than to use repeated subtraction in solving such equations as $80 \div 2 = n$. You know that $8 \div 2 = 4$. Does $80 \div 2 = 40$? What is the value of n in each equation below?

	a	*b*
1.	$2 \div 2 = n$	$20 \div 2 = n$
2.	$4 \div 2 = n$	$40 \div 2 = n$
3.	$6 \div 2 = n$	$60 \div 2 = n$
4.	$8 \div 2 = n$	$80 \div 2 = n$
5.	$3 \div 3 = n$	$30 \div 3 = n$
6.	$6 \div 3 = n$	$60 \div 3 = n$
7.	$9 \div 3 = n$	$90 \div 3 = n$
8.	$4 \div 4 = n$	$40 \div 4 = n$
9.	$8 \div 4 = n$	$80 \div 4 = n$
10.	$5 \div 5 = n$	$50 \div 5 = n$

You can use the sign $\overline{)}$ when solving such equations as those in *b* above. You can then show each step of the division. The division $2\overline{)80}$ asks the question "How many 2's are contained in 80?" The answer, or quotient, 40, is written above the dividend, 80. The tens of the quotient are written above the tens of the dividend. Where are the ones of the quotient written?

$$\begin{array}{r} 40 \\ 2\overline{)80} \\ -80 \\ \hline 0 \end{array}$$

The division is checked by multiplication. $40 \times 2 = 80$. The product, 80, is written underneath 80. A line is drawn underneath the product 80 to show that this part of the division is complete. 80 is subtracted from 80. The 0 is written underneath the line to show that there is a 0 remainder in the division.

Oral Be ready to tell the question asked by each equation below. Explain each division.

1. $20 \div 2 = n$
$$\begin{array}{r} 10 \\ 2\overline{)20} \\ -20 \\ \hline 0 \end{array}$$

2. $80 \div 4 = n$
$$\begin{array}{r} 20 \\ 4\overline{)80} \\ -80 \\ \hline 0 \end{array}$$

Written Copy. Find each quotient.

	a	*b*	*c*
1.	$5\overline{)50}$	$2\overline{)20}$	$4\overline{)80}$
2.	$2\overline{)40}$	$2\overline{)60}$	$3\overline{)90}$
3.	$2\overline{)80}$	$3\overline{)30}$	$3\overline{)60}$
4.	$6\overline{)60}$	$8\overline{)80}$	$7\overline{)70}$

Dividing Two-Digit Numbers

The number 86 may be thought of as 80+6. How might you think of 84? Of 66? Of 94?

In the equation 86÷2=n, you can think of 86 as 80+6. Then you can divide the 80 and the 6 separately, like this:

$$\begin{array}{r} 40 \\ 2\overline{)80} \\ -80 \\ \hline 0 \end{array} \qquad \begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 0 \end{array}$$

First divide 80 by 2, as follows:

Think: How many 2's are contained in 80? There are 40. Write 40 above 80. Multiply 40×2 and write the product 80 underneath 80. The line underneath 80 shows that one part of the division is complete. What does the 0 show?

Then divide 6 by 2.

Think: How many 2's are contained in 6? The answer is 3. Write 3 above 6. Multiply 3×2 and write the product 6 underneath 6. What does the line underneath 6 tell you? What does the 0 show?

You have found two **partial quotients**, 40 and 3. The quotient is 40+3, or 43. 86÷2=43.

Oral Be ready to tell how the division below was done.

$$96 \div 3 = n \qquad \begin{array}{r} 30 \\ 3\overline{)90} \\ -90 \\ \hline 0 \end{array} \qquad \begin{array}{r} 2 \\ 3\overline{)6} \\ -6 \\ \hline 0 \end{array}$$

Written Copy. Find each quotient by using the plan suggested above.

	a	*b*	*c*	*d*
1.	$2\overline{)68}$	$3\overline{)69}$	$4\overline{)84}$	$2\overline{)42}$
2.	$2\overline{)86}$	$2\overline{)48}$	$3\overline{)96}$	$4\overline{)88}$
3.	$2\overline{)62}$	$3\overline{)66}$	$2\overline{)64}$	$3\overline{)93}$
4.	$4\overline{)44}$	$2\overline{)66}$	$4\overline{)48}$	$2\overline{)44}$

Can you do this? Choose any number, and then do this:

1. Multiply your number by 5.
2. Add 6.
3. Multiply your sum by 4.
4. Add 9.
5. Multiply this sum by 5.
6. Cross out the last two digits of your product.
7. Subtract 1 from the remaining number.

What is your answer? Now choose another number and try again.

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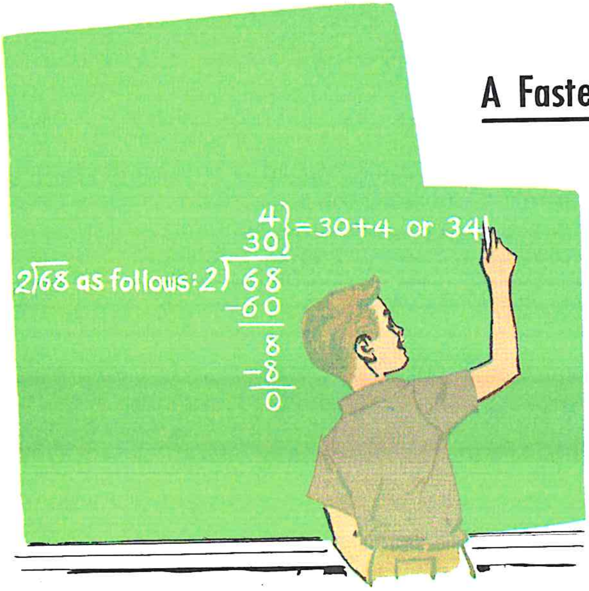
A Faster Way to Divide Two-Digit Numbers



You can solve such equations as $68 \div 2 = n$ without writing $2\overline{)60} + 2\overline{)8}$. The whole division can be done in a shorter way.

As you look at the 6 in 68, think of it as 60. Ask yourself, "How many 2's are contained in 60?" The answer, 30, is written as a partial quotient above 68, as shown below:

$$\begin{array}{rl} \left.\begin{array}{r}4\\30\end{array}\right\}=30+4 \text{ or } 34 & \\ 2\overline{)68} & \text{first division} \\ \underline{-60} & \\ 8 & \text{second division} \\ \underline{-8} & \\ 0 & \end{array}$$

Then continue as follows:

Multiply: $30 \times 2 = 60$. Write 60 underneath 68. Then draw a line to show that this part of the division is completed.

Subtract: $68 - 60 = 8$. Write 8 underneath the line.

You can divide the 8 without rewriting the division $2\overline{)8}$. Think: How many 2's are contained in 8? The answer is 4. Write 4 above the 0 as the second partial quotient. Multiply 4×2. Write 8 underneath the 8 and draw a line to show that this part of the division is finished.

Subtract: $8 - 8 = 0$. There is a 0 remainder. Next add the two partial quotients: $30 + 4 = 34$. Does $68 \div 2 = 34$?

Oral Be ready to tell how to find the quotient for each division in column *a* of the written practice.

Written Copy. Find each quotient. Check by multiplication.

	a	*b*	*c*	*d*
1.	$2\overline{)82}$	$3\overline{)63}$	$3\overline{)99}$	$2\overline{)88}$
2.	$3\overline{)36}$	$2\overline{)28}$	$4\overline{)84}$	$3\overline{)96}$
3.	$2\overline{)86}$	$3\overline{)39}$	$2\overline{)84}$	$2\overline{)26}$
4.	$3\overline{)69}$	$2\overline{)66}$	$4\overline{)48}$	$2\overline{)68}$
5.	$3\overline{)93}$	$2\overline{)64}$	$4\overline{)88}$	$4\overline{)44}$

Division with a Remainder Other Than Zero

To solve the equation $89 \div 4 = n$, think of 89 as $80+9$. Then you can do the division as shown below.

$$\begin{array}{rl}
\left.\begin{array}{r}2\\20\end{array}\right\} & =20+2 \\
4\overline{)89} & \text{or } 22 \text{ r1} \\
-80 & \\
\hline
9 & \\
-8 & \\
\hline
1 & \text{remainder}
\end{array}$$

Begin by thinking "How many 4's are contained in 80?" The answer is 20. Where is 20 written? What is the product of 20×4? Where is it written? What does the line underneath 80 tell you?

Look at the 9 underneath the line. It is the difference between 80 and 89. You are to divide it by 4. Think: Is 9 a multiple of 4? It isn't; so think of the multiple nearest to but smaller than 9. It is 8. Divide 8 by 4. The second partial quotient is 2. Where is it written?

A line is drawn underneath 8 to show that this part of the division is finished.

Subtract: $9-8=1$.

Think: How many 4's are contained in 1? The answer is *none;* so the division is finished. 1 is called a remainder. It is written after the total quotient, 22, as r1.

Oral Look at the completed division. Answer each question.

$$\begin{array}{rl}
\left.\begin{array}{r}2\\20\end{array}\right\} & =20+2 \\
3\overline{)67} & \text{or } 22 \text{ r1} \\
-60 & \\
\hline
7 & \\
-6 & \\
\hline
1 &
\end{array}$$

1. How are you to think of the dividend, 67?

2. How many 3's are contained in 60?

3. What does the line underneath 60 tell you?

4. What number nearest to but less than 7 is divisible by 3?

5. What does the line underneath 6 tell you?

6. Why is 1 called a remainder?

7. What does 22 r1 mean?

Written Copy. Find each quotient and remainder. Check.

	a	*b*	*c*	*d*
1.	$4\overline{)89}$	$2\overline{)67}$	$3\overline{)98}$	$2\overline{)49}$
2.	$3\overline{)67}$	$2\overline{)83}$	$3\overline{)65}$	$2\overline{)45}$

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Dividing Tens and Ones by One-Digit Divisors

The number 64 may be thought of as 6 tens and 4 ones. 86 may be thought of as 8 tens and 6 ones. How might you think of 44? Of 48?

In the equation $64 \div 2 = n$, think of 64 as 6 tens+4 ones. Then you can divide the 6 tens and the 4 ones separately, like this:

$$\begin{array}{cc} \text{Tens} & \text{Ones} \\ \begin{array}{r} 3 \\ 2\overline{)6} \\ -6 \\ \hline 0 \end{array} & \begin{array}{r} 2 \\ 2\overline{)4} \\ -4 \\ \hline 0 \end{array} \end{array}$$

In order to find the first partial quotient:

Divide: Think: How many 2's are contained in the 6 of the 6 tens? There are 3. Because the 6 you are dividing is really 6 tens, write 3 above 6 in tens place.

Multiply: 3 tens×2=6 tens. Write the product 6 underneath 6 to show that the division of tens is finished.

Subtract: 6 tens−6 tens=0. The remainder of tens is 0.

Now look at the division of ones. The division is done in the same way as the division of tens.

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What are the two partial quotients? What is the quotient? Does $64 \div 2 = 32$?

The equation $68 \div 3 = n$ can be solved by dividing tens and ones as shown below.

$$\begin{array}{cc} \text{Tens} & \text{Ones} \\ \begin{array}{r} 2 \\ 3\overline{)6} \\ -6 \\ \hline 0 \end{array} & \begin{array}{r} 2\text{ r}2 \\ 3\overline{)8} \\ -6 \\ \hline 2 \end{array} \end{array}$$

8 ones is not divisible by 3. What is the remainder?

The answer is 2 tens and 2 ones with a remainder of 2, or 22 r2.

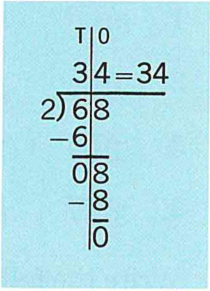
Oral Be ready to tell how to find the quotient for each division in column *a* of the written practice.

Written Copy. Find each quotient by dividing first the tens and then the ones. Check.

	a	*b*	*c*	*d*
1.	$4\overline{)84}$	$2\overline{)68}$	$2\overline{)88}$	$3\overline{)66}$
2.	$2\overline{)46}$	$3\overline{)69}$	$2\overline{)68}$	$3\overline{)99}$
3.	$4\overline{)88}$	$3\overline{)96}$	$2\overline{)82}$	$3\overline{)63}$
4.	$3\overline{)67}$	$2\overline{)87}$	$2\overline{)63}$	$4\overline{)83}$

Using a Grid in Dividing Tens and Ones by One-Digit Divisors

You can save time when dividing if you use a grid to help you keep the tens and ones separate. To solve an equation such as 68÷2=n, write 68 in a grid as shown. Begin with the tens.



Divide: Think: How many 2's are contained in the 6 of the 6 tens? There are 3. Because the 6 you are dividing is 6 tens, write 3 in tens place as the first partial quotient.

Multiply: 3 tens×2=6 tens. Write 6 in tens place underneath 6. Then draw a line underneath 6 to show that you have finished dividing the tens.

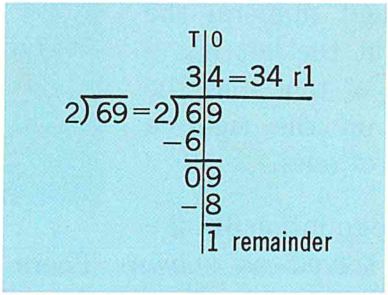
Subtract: 6 tens−6 tens=0. What is the remainder of tens?

To help you keep the tens and ones separate, draw a line as shown in the grid.

Then you are ready to divide the ones. Write the 8 ones of 68 in ones place at the right of the remainder of tens. Divide the ones as you divided the tens.

The quotient is 3 tens and 4 ones or 34.

The equation 69÷2=n can be solved in a grid as shown:



Oral Answer these questions about the above division.

1. What does the line underneath 6 tell you?

2. Why should 9 be written in ones place next to the 0 remainder?

3. What does the line underneath 8 tell you?

4. What is the value of n in the equation 69÷2=n?

Written Copy. Solve each equation.

	a	*b*
1.	84÷2=n	2×n=84
2.	39÷3=n	3×n=39
3.	44÷4=n	4×n=44
4.	98÷3=n	(3×n)+2=98
5.	89÷4=n	(4×n)+1=89

Practice in Dividing Tens and Ones by Ones

You may not need to use a grid in dividing tens and ones by ones. You know that in a two-digit numeral the digit at the left has a value of tens and the digit on the right a value of ones.

$$\begin{array}{r} 34 \\ 2\overline{)68} \\ -6 \\ \hline 08 \\ -8 \\ \hline 0 \end{array}$$

The equation $61 \div 2 = n$ is solved as shown. There are enough tens to divide. Are there enough ones to divide?

$$\begin{array}{r} 30 \text{ r}1 \\ 2\overline{)61} \\ -6 \\ \hline 01 \\ -0 \\ \hline 1 \end{array}$$

Look at the 1 next to the 0 remainder. Think: How many 2's are contained in 1? The answer is 0. Write the 0 as the second partial quotient. It is written underneath the 1.

What is the remainder of ones?

The quotient is 30. The remainder is 1.

Oral Be ready to explain each division below.

a	*b*
$\begin{array}{r} 32 \\ 2\overline{)64} \\ 6 \\ \hline 04 \\ 4 \\ \hline 0 \end{array}$	$\begin{array}{r} 30 \text{ r}2 \\ 3\overline{)92} \\ 9 \\ \hline 02 \\ 0 \\ \hline 2 \end{array}$

Written Copy. Find each quotient.

	a	*b*	*c*	*d*
1.	$8\overline{)80}$	$4\overline{)81}$	$5\overline{)55}$	$6\overline{)64}$
2.	$9\overline{)98}$	$3\overline{)67}$	$7\overline{)79}$	$4\overline{)48}$
3.	$9\overline{)99}$	$7\overline{)73}$	$3\overline{)96}$	$5\overline{)57}$
4.	$3\overline{)37}$	$6\overline{)68}$	$4\overline{)82}$	$6\overline{)60}$

Write the following divisions, using the sign $\overline{)\quad}$. Find each quotient.

	a	*b*
5.	$96 \div 9 = n$	$n \times 8 = 96$
6.	$44 \div 2 = n$	$n \times 2 = 44$
7.	$81 \div 2 = n$	$(n \times 2) + 1 = 81$
8.	$57 \div 5 = n$	$(n \times 5) + 2 = 57$
9.	$76 \div 7 = n$	$(n \times 7) + 4 = 74$

A quick review

	a	*b*	*c*	*d*
1.	$7\overline{)70}$	$2\overline{)89}$	$4\overline{)49}$	$3\overline{)62}$
2.	$\begin{array}{r} 576 \\ -109 \\ \hline \end{array}$	$\begin{array}{r} 988 \\ -899 \\ \hline \end{array}$	$\begin{array}{r} 2592 \\ -1185 \\ \hline \end{array}$	$\begin{array}{r} \$6.00 \\ -3.85 \\ \hline \end{array}$
3.	$\begin{array}{r} 48 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 90 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 161 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} \$2.75 \\ \times 4 \\ \hline \end{array}$
4.	$\begin{array}{r} 692 \\ 723 \\ +214 \\ \hline \end{array}$	$\begin{array}{r} 613 \\ 79 \\ +588 \\ \hline \end{array}$	$\begin{array}{r} 1920 \\ 208 \\ +2293 \\ \hline \end{array}$	$\begin{array}{r} \$11.72 \\ 64.39 \\ +6.28 \\ \hline \end{array}$

A
$$72 \div 9 = n \quad \begin{array}{r} 8 \\ 9\overline{)72} \end{array}$$

B
$$40 \div 9 = n \quad \begin{array}{r} 4 \text{ r}4 \\ 9\overline{)40} \\ \underline{36} \\ 4 \end{array}$$

C
$$64 \div 2 = n \quad \begin{array}{r} 32 \\ 2\overline{)64} \\ \underline{6} \\ 4 \\ \underline{4} \\ 0 \end{array}$$

D
$$67 \div 3 = n \quad \begin{array}{r} 22 \text{ r}1 \\ 3\overline{)67} \\ \underline{6} \\ 7 \\ \underline{6} \\ 1 \end{array}$$

E
$$81 \div 4 = n \quad \begin{array}{r} 20 \text{ r}1 \\ 4\overline{)81} \\ \underline{8} \\ 1 \\ \underline{0} \\ 1 \end{array}$$

Practicing Division

In A, 72 is a multiple of 9; so it is divisible by 9. Look at the equation in B. Is 40 a multiple of 9? Is it divisible by 9? What is the nearest multiple of 9 that is less than 40? It is 36; so 36 is divided by 9. What is the remainder in this division?

In C, in D, and in E, first the tens and then the ones were divided. Try to tell the steps used in finding each partial quotient and the quotient in each.

Oral Be ready to tell the answer to each division below.

	a	*b*	*c*	*d*
1.	$6\overline{)6}$	$2\overline{)4}$	$3\overline{)9}$	$3\overline{)6}$
2.	$2\overline{)3}$	$3\overline{)7}$	$2\overline{)9}$	$3\overline{)8}$
3.	$9\overline{)63}$	$3\overline{)18}$	$8\overline{)72}$	$4\overline{)28}$
4.	$7\overline{)56}$	$6\overline{)12}$	$8\overline{)64}$	$9\overline{)81}$
5.	$9\overline{)47}$	$7\overline{)16}$	$6\overline{)35}$	$8\overline{)19}$
6.	$7\overline{)26}$	$9\overline{)40}$	$8\overline{)30}$	$6\overline{)19}$

Solve each equation below.

	a	*b*
7.	$n \times 4 = 8$	$n \times 4 = 4$
8.	$n \times 2 = 8$	$n \times 2 = 6$
9.	$(n \times 4) + 1 = 5$	$(n \times 5) + 3 = 8$
10.	$(n \times 3) + 1 = 7$	$(n \times 3) + 2 = 5$
11.	$n \times 7 = 49$	$n \times 6 = 24$

Written Copy. Write each quotient.

	a	*b*	*c*	*d*
1.	$2\overline{)68}$	$3\overline{)66}$	$7\overline{)77}$	$3\overline{)93}$
2.	$9\overline{)99}$	$3\overline{)99}$	$6\overline{)66}$	$2\overline{)84}$
3.	$3\overline{)98}$	$7\overline{)71}$	$8\overline{)87}$	$4\overline{)81}$
4.	$4\overline{)83}$	$4\overline{)85}$	$2\overline{)45}$	$2\overline{)87}$
5.	$4\overline{)49}$	$3\overline{)65}$	$8\overline{)89}$	$6\overline{)68}$
6.	$2\overline{)46}$	$2\overline{)22}$	$5\overline{)55}$	$4\overline{)84}$
7.	$4\overline{)44}$	$2\overline{)42}$	$4\overline{)48}$	$3\overline{)36}$
8.	$5\overline{)54}$	$9\overline{)98}$	$3\overline{)37}$	$6\overline{)65}$

Using Division or Multiplication in Solving Problems

Read each problem. Pay special attention to the question. If you are to separate a group, or set, into equal groups, divide the numbers of the sets. If you are to join equal groups, or sets, multiply the numbers.

Oral Be ready to tell the steps you would take to solve each of the following problems. Tell the equation you would use in each one. Reminder: The words *dollars* and *cents* are not part of an equation. They belong to the answer only.

1. The girls planned to make signs for a fair. They needed 36 signs. If each girl makes 3 signs, how many girls should be on the committee to make signs?

2. Tom sold 9 tickets at 25¢ each. How much money did Tom receive for the tickets?

3. A committee of girls made 60 popcorn balls. They decided to put them into plastic bags with 2 popcorn balls in each bag. How many plastic bags did they need?

4. The children bought 4 packages of balloons to use for decorating the gym. There were 48 balloons in a package. How many balloons did they buy?

5. The boys blew up 38 balloons. They planned to tie them in groups of 3 balloons each. How many groups of balloons could they make and how many balloons would be left?

6. The children decided to buy 4 large cakes from the bakery. Each cake was cut into 64 pieces. How many pieces did they have in all?

7. Tom sold bags of popcorn at 5¢ each. Mrs. Amory wanted 50¢ worth of popcorn. How many bags of popcorn should Tom give her?

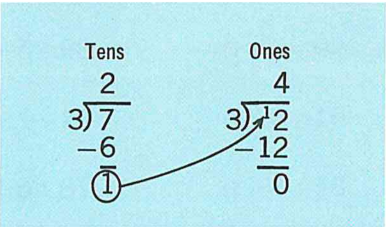
8. Roger spent 24¢ for fudge at 2¢ a piece. How many pieces of candy did Roger buy?

9. Nancy's mother bought 3 large boxes of candy at $1.25 a box. How much did she spend?

Written Write the equations for problems 1 through 9 above. Then solve each problem.

Division with a Remainder in Tens Place

In the equation 72÷3=n, 7 tens are not divisible by 3; so there will be a remainder of tens. The division may be done as shown:



Begin with the tens.

Divide: Think: How many 3's are contained in the 7 of the 7 tens? There are 2. Because the 7 you are dividing is really 7 tens, write 2 above 7 in tens place.

Multiply: 2 tens×3=6 tens. Write 6 underneath 7. Draw a line underneath 6. Why?

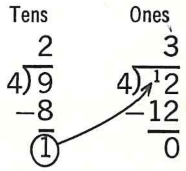
Subtract: 7 tens−6 tens=1 ten. Think: How many 3's are contained in the 1 of the 1 ten? The answer is 0. Therefore 1 ten is a remainder.

The form of 1 ten is changed to 10 ones and added to the ones as shown by the reminder numeral in the ones place. Then 12 is divided by 3. The quotient is 2 tens and 4 ones, or 24.

You can check the division by using multiplication. Does 24×3=72?

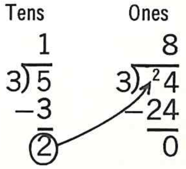
Oral Be ready to explain each division below.

1. 92÷4=n



Then 92÷4=2 tens and 3 ones or 23.

2. 54÷3=n



Then 54÷3=1 ten and 8 ones or 18.

Written Write each division, using the sign $\overline{)\quad}$. Find each quotient by dividing the tens and the ones as shown above.

	a	*b*
1.	84÷7=n	38÷2=n
2.	68÷4=n	57÷3=n
3.	75÷5=n	92÷4=n
4.	42÷3=n	78÷6=n
5.	91÷7=n	80÷5=n
6.	54÷2=n	90÷6=n
7.	48÷3=n	76÷4=n
8.	52÷4=n	78÷3=n

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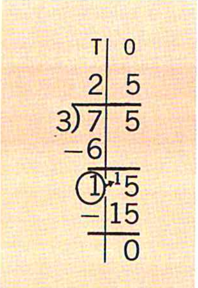
Using a Grid in Division

The equation $75 \div 3 = n$ can be solved in a grid as shown.

First the tens are divided.



Divide: Think: How many 3's are contained in the 7 of the 7 tens? The answer is 2. Write 2 in tens place in the quotient. Why?

Multiply: 2 tens × 3 = 6 tens. Write 6 tens below 7. Draw a line below 6. Why?

Subtract: 7 tens − 6 tens = 1 ten. You cannot divide the 1 of 1 ten by 3. Why? Change the form of 1 ten to 10 ones and add them to the 5 ones as shown. Then divide 15 ones by 3.

The quotient is 2 tens and 5 ones, or 25.

Oral Be ready to tell how to solve each equation below using the grid.

	a	*b*
1.	$96 \div 4 = n$	$72 \div 4 = n$
2.	$75 \div 6 = n$	$68 \div 3 = n$
3.	$99 \div 8 = n$	$69 \div 5 = n$
4.	$88 \div 7 = n$	$57 \div 3 = n$

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Written Copy onto grids. Find each partial quotient and quotient.

	a	*b*
1.	$38 \div 2 = n$	$54 \div 4 = n$
2.	$59 \div 3 = n$	$39 \div 5 = n$
3.	$91 \div 6 = n$	$84 \div 7 = n$
4.	$84 \div 3 = n$	$78 \div 6 = n$
5.	$61 \div 5 = n$	$55 \div 4 = n$
6.	$60 \div 5 = n$	$88 \div 6 = n$
7.	$56 \div 4 = n$	$75 \div 3 = n$
8.	$98 \div 4 = n$	$36 \div 2 = n$

Copy. Write each quotient. Check by multiplying.

	a	*b*	*c*	*d*
9.	$6\overline{)71}$	$4\overline{)93}$	$3\overline{)65}$	$7\overline{)85}$
10.	$5\overline{)88}$	$2\overline{)59}$	$9\overline{)98}$	$8\overline{)92}$

A quick review

	a	*b*
1.	$3 \times 312 = n$	$72 \div 3 = n$
2.	$8000 - n = 217$	$n - 985 = 1000$
3.	$8750 + 4189 = n$	$461 + n = 2025$
4.	$2 \times 468 = n$	$96 \div 5 = n$

Practicing Division

You may be able to divide tens and ones without using a grid. The equation 76÷4=n can be solved as shown. Consider the tens first.

Divide: Think: How many 4's are contained in the 7 of the 7 tens? The answer is 1 ten. Write 1 in tens place. Why?

$$\begin{array}{r} 19 \\ 4\overline{)76} \\ \underline{4} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

Multiply: 1 ten×4=4 tens. Write 4 in tens place underneath 7.

Then draw a line underneath 4 to show that you have finished dividing the tens.

Subtract: 7 tens−4 tens=3 tens. The remainder is 3 tens.

The divisor 4 is more than 3.

You cannot divide the 3 of the 3 tens by 4. Why? You think of them as 30 ones, but you don't need to write them as 30 ones. Write 6 ones underneath the first line you drew. Think of them as added to the 30 ones you remembered. Then you have 36 ones rather than 3 tens and 6 ones to divide. Consider the ones next.

Divide: Think: How many 4's are contained in 36 ones? The answer, 9, is written in ones place of the quotient. Why?

Multiply: 9 ones×4=36 ones. Write 36 beneath 36. Draw a line underneath 36 to show you have finished dividing the ones.

Subtract: 36−36=0. There is a remainder of 0.

The quotient is 1 ten and 9 ones, or 19. The value of n is 1 ten and 9 ones, or 19.

Sometimes there is a remainder of ones. Then the division is done as shown. The remainder is written at the right of the quotient.

$$\begin{array}{r} 16 \text{ r}3 \\ 4\overline{)67\phantom{\text{ r}3}} \\ \underline{4}\phantom{\text{ r}3} \\ 27\phantom{\text{ r}3} \\ \underline{24}\phantom{\text{ r}3} \\ 3\phantom{\text{ r}3} \end{array}$$

Oral Be ready to tell how you would do each division below.

	a	*b*	*c*	*d*
1.	$7\overline{)84}$	$3\overline{)75}$	$6\overline{)96}$	$3\overline{)84}$
2.	$5\overline{)85}$	$4\overline{)72}$	$8\overline{)96}$	$7\overline{)91}$

Written Copy each division in rows 1 and 2 above. Find each quotient. Reminder: If tens are left when you are dividing, change the form of the tens left to ones. Add them to the ones.

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Review

Part 1 Copy. Write each quotient.

	a	*b*	*c*	*d*
1.	$7\overline{)63}$	$8\overline{)56}$	$6\overline{)49}$	$9\overline{)78}$
2.	$6\overline{)60}$	$8\overline{)85}$	$5\overline{)54}$	$3\overline{)97}$
3.	$4\overline{)68}$	$3\overline{)72}$	$5\overline{)88}$	$7\overline{)81}$

Part 2 Copy. Write each product.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}234\\ \times 2\\ \hline\end{array}$	$\begin{array}{r}325\\ \times 6\\ \hline\end{array}$	$\begin{array}{r}541\\ \times 7\\ \hline\end{array}$	$\begin{array}{r}234\\ \times 9\\ \hline\end{array}$
2.	$\begin{array}{r}423\\ \times 8\\ \hline\end{array}$	$\begin{array}{r}952\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}745\\ \times 6\\ \hline\end{array}$	$\begin{array}{r}898\\ \times 5\\ \hline\end{array}$
3.	$\begin{array}{r}676\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}867\\ \times 9\\ \hline\end{array}$	$\begin{array}{r}781\\ \times 5\\ \hline\end{array}$	$\begin{array}{r}659\\ \times 8\\ \hline\end{array}$

Part 3 Copy. Write each sum or difference.

	a	*b*	*c*
1.	$\begin{array}{r}8232\\ 5132\\ +1795\\ \hline\end{array}$	$\begin{array}{r}2315\\ 6457\\ +8269\\ \hline\end{array}$	$\begin{array}{r}3728\\ 7669\\ +3104\\ \hline\end{array}$
2.	$\begin{array}{r}7453\\ 4781\\ 4973\\ +3697\\ \hline\end{array}$	$\begin{array}{r}6564\\ 2978\\ 2580\\ +8401\\ \hline\end{array}$	$\begin{array}{r}1679\\ 3896\\ 1162\\ +5243\\ \hline\end{array}$
3.	$\begin{array}{r}8417\\ -1501\\ \hline\end{array}$	$\begin{array}{r}4248\\ -2679\\ \hline\end{array}$	$\begin{array}{r}8153\\ -4585\\ \hline\end{array}$
4.	$\begin{array}{r}9326\\ -9192\\ \hline\end{array}$	$\begin{array}{r}6732\\ -3634\\ \hline\end{array}$	$\begin{array}{r}3568\\ -2769\\ \hline\end{array}$
5.	$\begin{array}{r}2881\\ -1916\\ \hline\end{array}$	$\begin{array}{r}7915\\ -5871\\ \hline\end{array}$	$\begin{array}{r}9070\\ -6379\\ \hline\end{array}$

Part 4 Solve each equation below.

	a	*b*
1.	$(n \times 5) + 2 = 17$	$n \times 9 = 36$
2.	$3 \times n = 72$	$(n \times 6) + 3 = 27$
3.	$7 \times 127 = n$	$3 \times 680 = n$

Part 5 Solve the following problems. Write each equation.

1. The 35 children in the class were divided into 3 equal groups. How many children were in each group? How many were left?

2. Tom's father took 6 cases of eggs to market. There were 144 eggs in each case. How many eggs did Tom's father have in all?

3. 1432 children attended the county school picnic. 358 of them were from the Ray School. How many came from other schools?

4. Mr. Burns drove 7251 miles the first year and 8006 miles the second year. How many miles did he drive in the two years?

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. A quotient can be determined by repeated subtractions. (97)

2. A division is not completed until the remainder of ones, if any, is less than the divisor. (97)

3. Tens are divided in the same way as ones. (102)

Words to Know

Partial quotient (99)

Questions to Discuss

1. How can you use repeated subtraction to solve the equation $80 \div 4 = n$? (97)

2. How could you find the value of n in the equation $60 \div 3 = n$? (98)

3. In the division shown at the right, what does the 20 mean? What does the 2 mean? (101)

$$\begin{array}{r} 20\text{ r}2 \\ 4\overline{)82} \\ \underline{8} \\ 2 \end{array}$$

4. How do you divide 95 by 3? (102)

5. How can you decide whether to divide or to subtract to solve problems which tell about equal groups, or sets? (97, 98)

6. When must you change tens to ones in division? (107)

Written Practice

Part 1 Write each division below, using the sign $\overline{)\quad}$. Find each quotient. Check by multiplying.

	a	*b*	
1.	$40 \div 2 = n$	$90 \div 3 = n$	(98)
2.	$83 \div 4 = n$	$52 \div 5 = n$	(101)
3.	$88 \div 2 = n$	$46 \div 4 = n$	(100)
4.	$64 \div 4 = n$	$87 \div 5 = n$	(107)
5.	$93 \div 6 = n$	$95 \div 8 = n$	(107)

Part 2 Read each problem carefully. Write an equation for it. Solve the equation and write the answer to the problem. (106)

1. Joann bought 4 boxes of cookies. There were 24 cookies in each box. How many cookies did she buy?

2. Dick had 64 eggs, which he put into boxes with 6 eggs in each box. How many boxes did he fill and how many eggs were left?

3. The 36 pupils in a class were divided into 3 teams with the same number of pupils on each team. How many pupils were on each team?

Self-Evaluation

Part 1 Copy. Write each sum. Check by adding in a different order.

	a	*b*	*c*	*d*
1.	357 +413	124 +973	695 +325	385 +996
2.	413 663 +828	475 289 +434	398 943 +295	568 253 +683
3.	237 849 659 +937	725 343 586 +393	438 332 956 +937	124 973 693 +542

Part 2 Copy. Write each difference. Check by adding.

	a	*b*	*c*	*d*
1.	385 −39	508 −65	820 −97	400 −29
2.	807 −609	600 −419	689 −590	840 −375
3.	600 −427	805 −369	910 −788	800 −468

Part 3 Copy. Write each difference. Check by adding.

	a	*b*	*c*	*d*
1.	8969 −3781	5169 −2899	7000 −2165	6207 −4989
2.	4300 −2790	9010 −8790	7180 −6593	8000 −5314

Part 4 Copy. Write each product. Check by multiplying again.

	a	*b*	*c*	*d*
1.	32 ×3	96 ×8	47 ×5	89 ×2
2.	53 ×6	68 ×4	52 ×9	74 ×7
3.	23 ×8	98 ×9	69 ×6	45 ×7

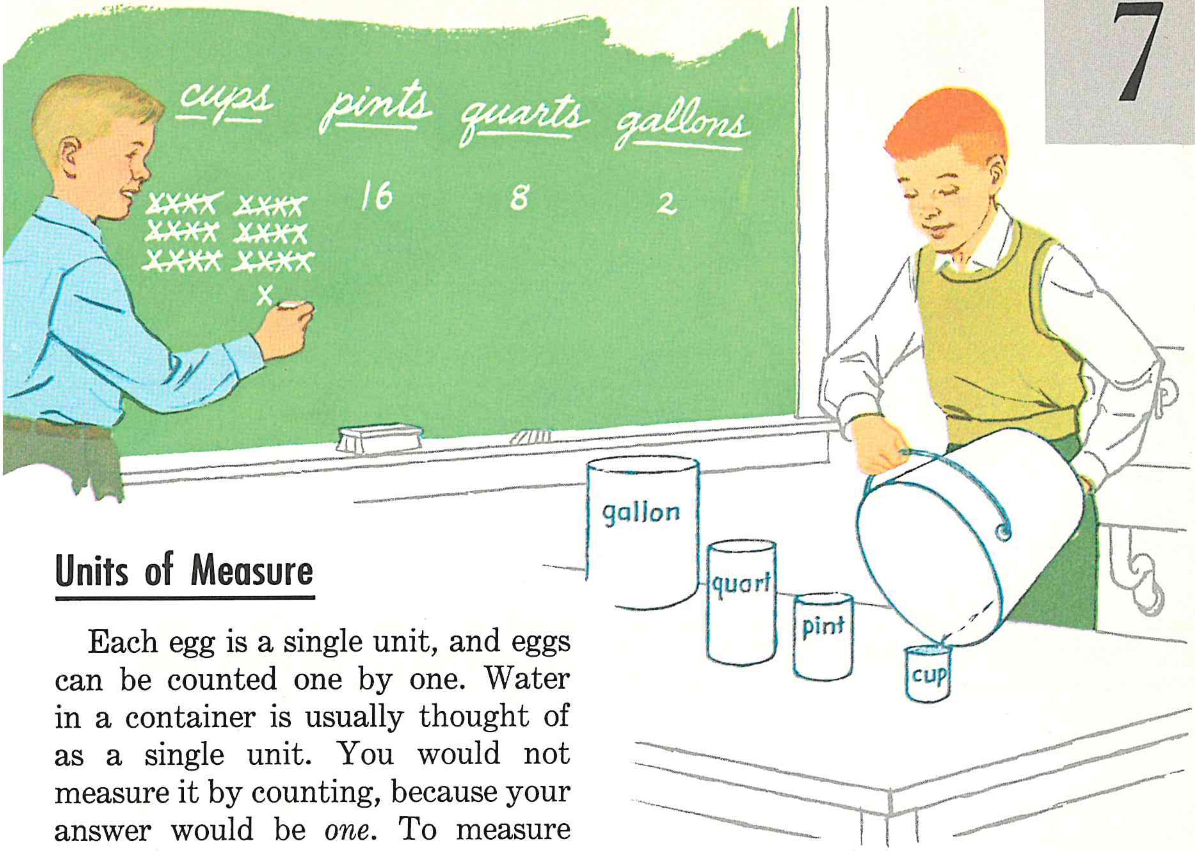
Part 5 Copy. Write each product.

	a	*b*	*c*	*d*
1.	231 ×4	453 ×2	686 ×6	978 ×7
2.	524 ×3	312 ×5	745 ×9	867 ×8
3.	428 ×9	969 ×5	134 ×8	810 ×7

Part 6 Copy. Write each quotient. Check by multiplying.

	a	*b*	*c*	*d*
1.	$5\overline{)55}$	$7\overline{)71}$	$4\overline{)86}$	$3\overline{)67}$
2.	$6\overline{)63}$	$9\overline{)94}$	$2\overline{)43}$	$8\overline{)85}$
3.	$8\overline{)80}$	$5\overline{)52}$	$3\overline{)64}$	$4\overline{)87}$
4.	$4\overline{)48}$	$6\overline{)67}$	$7\overline{)72}$	$9\overline{)96}$
5.	$8\overline{)96}$	$6\overline{)90}$	$5\overline{)72}$	$7\overline{)86}$

7



Units of Measure

Each egg is a single unit, and eggs can be counted one by one. Water in a container is usually thought of as a single unit. You would not measure it by counting, because your answer would be *one*. To measure water, you first separate it into smaller units by pouring it into smaller containers. You count these containers one by one to find how many of the smaller units are needed to contain all of the water in the larger one.

The smaller container, which is your **unit of measure,** could be any size you wanted.

The size of some units of measure is set by law. Such units of measure are called **standard units of measure.** The inch, the gallon, and the pound are standard units of measure.

Oral Answer these questions.

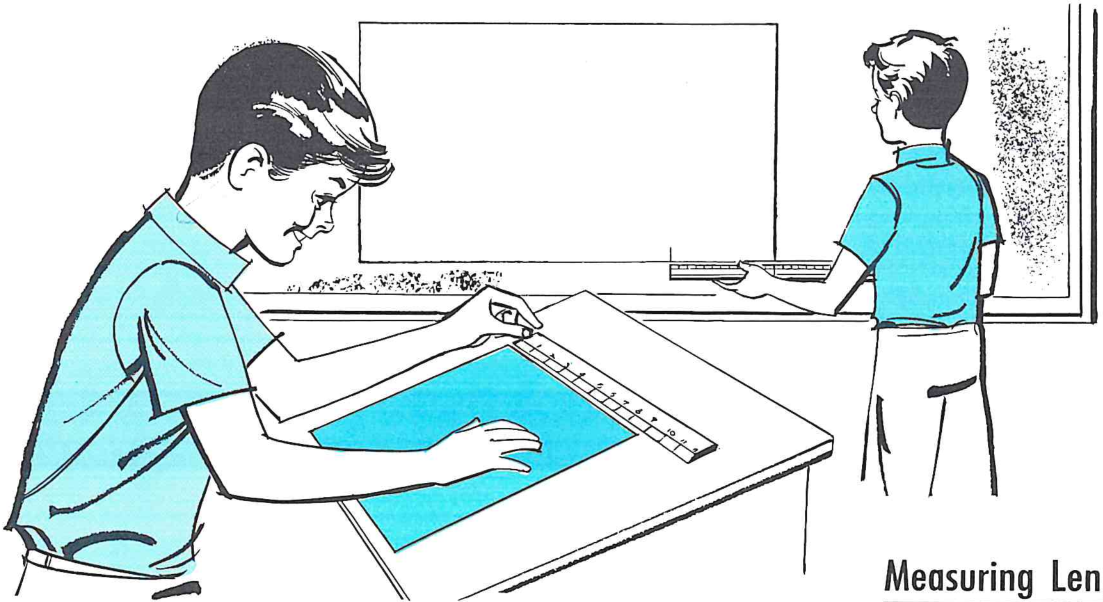
1. Do you get an exact answer when you count objects one by one?

2. Would you expect everyone who measured the water in a pail to get the same answer? Why or why not?

3. Why can't you get an exact answer when using a measure?

4. Why must standard units of measure be as accurate as possible?

5. Why must measuring be done very carefully?



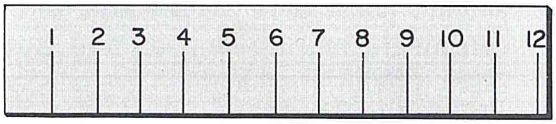
Measuring Length

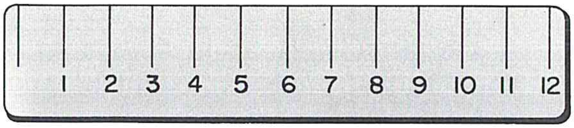
We use **linear measures** to find how long, how wide, how deep, how high, or how thick something is. The inch, the foot, the yard, and the mile are all examples of linear measures.

The boy measuring the paper is using a foot ruler. It is 12 inches long. Do you see the beginning point of his ruler? Is this point at one edge of the paper? What number on the ruler is at the other edge of the paper? It is 9. The boy can think of the paper as divided into 9 equal strips, each 1 inch high. The paper is 9 inches wide.

A ruler is divided into parts of equal length, and these parts are marked off by lines. Because the marks or lines are all at equal distances from each other, they are called **equidistant.** Any ruler or line drawing which contains equidistant marks is called a **scale.** The beginning point of a scale is marked 0. Sometimes it is left unmarked and merely understood to be zero.

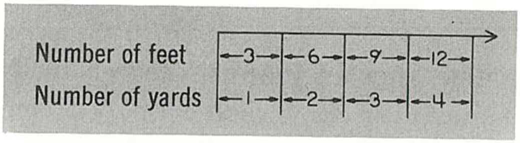
Notice the scale of each picture of a ruler below. What is the last number on each scale?





A ruler does not need to be **1** foot long. You may have used 6-inch rulers or rulers of some other length. Why is it a good idea to have rulers of different lengths?

The boy who is at the board on page 114 is using a yardstick. Where did he place the beginning point of the yardstick when he began measuring the board? Do you see that he made a tiny mark on the board to mark off a 36-inch length? Then where did he place the beginning point of his ruler? 36 inches and 12 inches are how many inches? What is the length of the board in inches?



The measure called one yard contains 36 inches, or 3 feet. How many inches do 2 yards contain? 3 yards? 4 yards?

A mile is the distance between a beginning point and an end point that are 5280 feet, or 1760 yards, apart. What instrument is usually used when one wants to measure distance in miles?

When used with measures, the = sign means *is equivalent to,* or *is equal in-value to.*

12 inches (in.) = 1 foot (ft.)
36 inches (in.) = 1 yard (yd.)
3 feet (ft.) = 1 yard (yd.)
5280 feet (ft.) = 1 mile (mi.)
1760 yards (yd.) = 1 mile (mi.)

Oral Tell which number is missing in the statements below.

	a	*b*
1.	1 ft. = ? in.	12 in. = ? ft.
2.	2 ft. = ? in.	1 yd. = ? ft.
3.	2 yd. = ? ft.	1 yd. = ? in.
4.	1 yd. = ? ft.	36 in. = ? ft.
5.	1 mi. = ? ft.	2 mi. = ? yd.

Written Write statements 1 through 5 above. Supply each missing numeral.

Something to do

1. Measure the length of your classroom, using a foot ruler. Then measure it using a yardstick. Which is the more accurate way to measure this length? Why?

2. Measure the length and width of the top of your desk. Did you get the same answer as the other children who measured their desks?

3. Measure each piece of string below. Give its length in inches.

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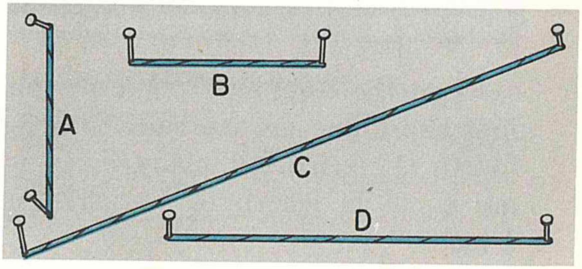
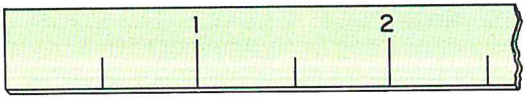


Using Fractional Parts of an Inch

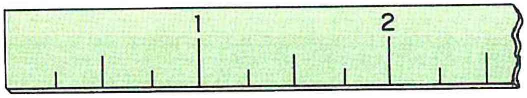
You sometimes need units of measure that are smaller than an inch. Most boards, for example, are less than 1 inch thick; so you cannot give the thickness in whole inches. A good way to get smaller units of measure is to divide the inch measure into smaller equal parts.

Each inch in the ruler below is divided into two equal parts. Each equal part measures a half inch.



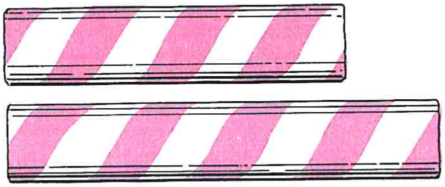
From the beginning point of the ruler to the first mark is one-half ($\frac{1}{2}$) inch. Two half inches are the same length as 1 inch. Three half inches have the same length as $1\frac{1}{2}$ inches.

To have still smaller units than a half inch, you might use a ruler with each inch divided into four equal parts, or fourths, as shown.



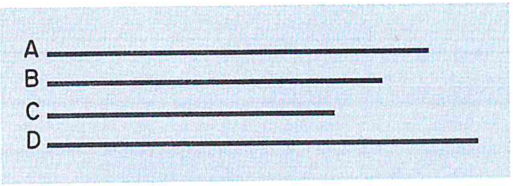
From the beginning point to the first short line on the ruler is one-fourth ($\frac{1}{4}$) inch. How many $\frac{1}{4}$ inches are equal in length to $\frac{1}{2}$ inch? To 1 inch?

Using a ruler marked only in inches, you can give measures to the nearest whole inch. Measure each candy stick below to the nearest inch.



The shorter piece is nearer to 2 inches than to 1 inch long. To the nearest inch, its length is 2 inches. To the nearest inch, what is the length of the longer piece of candy?

Oral Tell the length of each line below to the nearest inch, to the nearest half inch, and to the nearest quarter inch.



Written Use your ruler to draw lines on your paper as follows.

	a	*b*
1.	1 inch	$1\frac{1}{2}$ inches
2.	$2\frac{1}{4}$ inches	$3\frac{3}{4}$ inches
3.	$4\frac{1}{2}$ inches	$5\frac{3}{4}$ inches

Solving Problems

The first step in solving a problem is to read it carefully. Decide what should be done with the sets of objects in the problem to answer the question. Then write the equation for the problem. In the equation use numerals, signs, and the letter n. The words *inches, feet, yards,* or *miles,* whichever is correct, should be part of your thinking and of your answer only. They are never included in the equation.

Solve each equation. The value of n will be the answer to the problem. Read the problem again to see whether your answer is sensible. If it is, write the answer.

Use the plan suggested above to help you solve each problem below. Then solve each problem. Write the answer.

1. A football team made a gain of 4 yards on one play, 10 yards on the next play, and 5 yards on the third. How many yards did they gain in the three plays?

2. An airplane was flying at a height, or altitude, of 4 miles. What was the altitude of the airplane in feet?

3. In a bad storm an airplane dropped from an altitude of about 15,000 feet down to an altitude of about 13,960 feet. About how many feet of altitude did the airplane lose during the storm?

4. Sally has a roll of ribbon that has 12 yards of ribbon on it. How many inches of ribbon are on the spool?

5. The school playground is 95 feet wide. What is its width in yards and feet?

6. Elmer read about a mountain peak that was 21,300 feet high. Was the height of the mountain more or less than 4 miles? By how much?

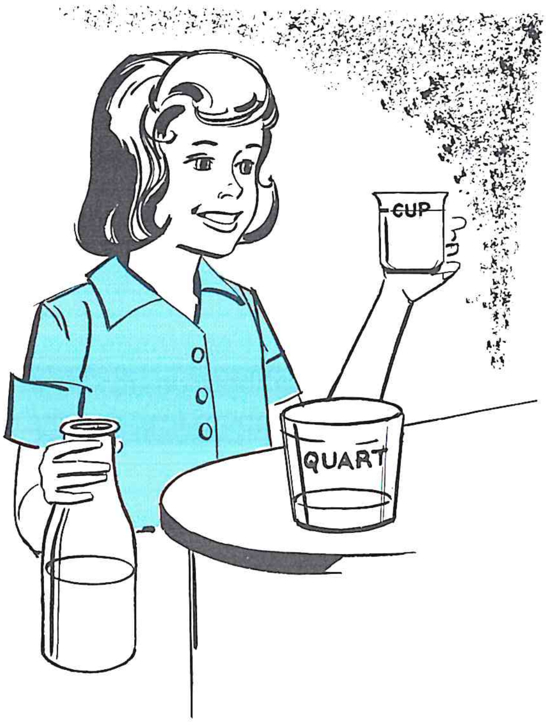
7. Each roll of tape held 1296 inches of tape. How many inches of tape were on 6 rolls of tape of this kind?

8. A playground had a length of 85 yards. What was its length in feet?

9. The Baylors drove 235 miles on Monday, 315 miles on Tuesday, 398 miles on Wednesday, and 375 miles on Thursday. How far did they drive altogether?

10. The pilot of a jet plane had to bail out at a height of 5 miles. How many feet above the earth was he when he bailed out?

Liquid Measure



Jane is using a measuring cup to find how many cups of milk are in the bottle. She begins by making sure that her cup is empty. Then she pours milk into the cup, filling it to the mark *1 cup*. She empties the cup and fills it again. The number of times she fills the cup is the measure of the milk in cups.

Other units of measure used in measuring liquids are pints, quarts, and gallons. A table of equivalent liquid measures is given below.

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2 measuring cups (c.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Now look at the table below. It will help you see how the different units of liquid measure are related to 1 gallon.

Number of cups	←16→	←32→	←48→
Number of pints	←8→	←16→	←24→
Number of quarts	←4→	←8→	←12→
Number of gallons	←1→	←2→	←3→

Do you see that 4 quarts are equal in value, or equivalent, to 1 gallon? How many pints are equivalent to 1 gallon? How many cups are equivalent to 1 gallon?

Oral Answer these questions.

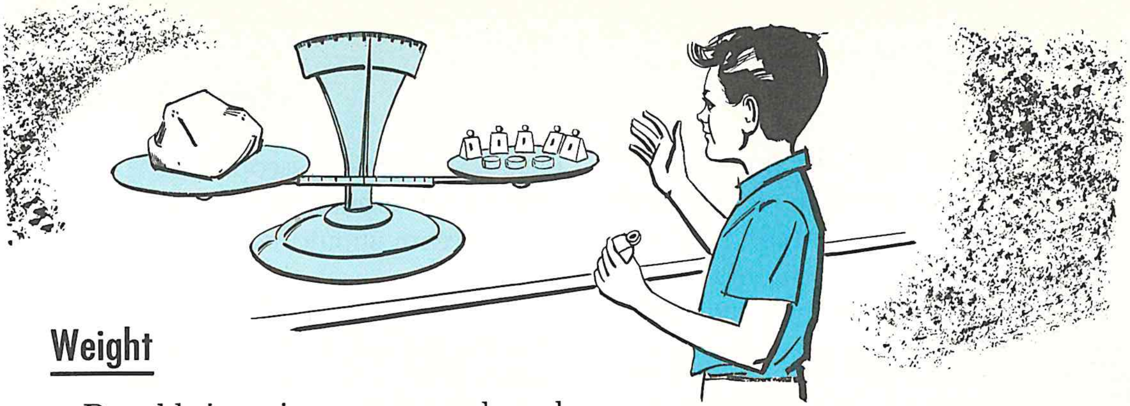
1. How many quarts are equivalent to 2 gallons? To 3 gallons?

2. How many pints are equivalent to 4 quarts? To 16 cups?

3. How many cups are equivalent to 2 gallons? To 3 gallons?

Written Write your answers to questions 1, 2, and 3 above.

Something to do Find cans and bottles of different sizes. Estimate how many cups, pints, quarts, or gallons each holds. Write your estimate on the board. Then fill the can or bottle with water. Use a cup, pint, quart, or gallon measure. How close was your estimate?

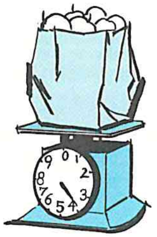


Weight

Ronald is using one-pound and one-ounce weights to measure the weight of the rock. He has used 5 weights of 1 pound each and 3 weights of 1 ounce each. The rock is equivalent in weight to the weight of 5 pounds and 3 ounces.

A weighing scale has a dial or number line marked off in **segments,** or parts, of equal length. Because marks spaced in this way are called a *scale,* the instrument used to tell weight is called a scale also.

At the right, the pointer moved from 0 on the scale to almost 4. To the nearest whole pound, the bag of apples weighs 4 pounds. Do you see why the pointer should be at 0 before the weighing is begun?



To simplify the weighing of heavy objects, a measure of weight called *ton* is often used. A ton is equivalent to 2000 pounds. The following tables will help you see the relation between pounds and ounces and between pounds and tons.

Number of ounces	16	32	48
Number of pounds	1	2	3

Number of pounds	2000	4000	6000
Number of tons	1	2	3

You will need to know these equivalent measures.

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton (T.)

Oral Answer these questions.

1. What are some of the kinds of weighing scales that you have seen?

2. Why are many kinds of weighing scales needed?

Something to do If you have a scale at school, estimate the weight of some objects. Then weigh them. How well did you estimate?

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Solving Problems

Decide how you will express your answer to each problem on this page before you try to solve it. Write each equation to use in solving the problem. Then solve the equation.

Check your addition, subtraction, multiplication, or division before you write your answer to each problem.

1. A store was selling ice cream at 29¢ a pint. How much would 8 pints of ice cream cost?

2. A gallon of ice cream cost $2.00. Is this ice cream cheaper or more expensive than ice cream at 29¢ a pint? By how much?

3. A farmer sells milk to the dairy in cans that hold 8 gallons of milk. How many quart bottles of milk can the dairy fill from each can of milk?

4. A truck loaded with furniture weighed 12,575 pounds. The empty truck had a weight of 8800 pounds. What was the weight of the furniture alone?

5. A truck driver delivered 5 loads of sand. Each load had a weight of about 8500 pounds. What was the weight in pounds of all 5 loads of sand?

6. The class plans to serve ice cream to 48 people at a picnic. The class can serve 3 people from each pint of ice cream. How many pints of ice cream should the class buy?

7. James had a bag of potatoes that weighed 60 pounds. He planned to put them into bags with 5 pounds in a bag. How many bags did he need?

8. A milkman delivered 95 bottles of milk to a classroom in 5 days, with the same number of bottles each day. How many bottles of milk did he deliver each day?

A quick review

	a	*b*
1.	4 ft. = ? in.	5 yd. = ? ft.
2.	72 in. = ? ft.	9 ft. = ? yd.
3.	12 pt. = ? gal.	16 c. = ? pt.
4.	$(24 \div 4) \times 3 = n$	$(5 \times 14) + 4 = n$
5.	$(63 \div 9) + 12 = n$	$(54 \div 6) - 6 = n$
6.	$997 + 201 = n$	$623 + 286 = n$
7.	$807 + 308 = n$	$375 + 235 = n$
8.	$799 - 568 = n$	$243 - 140 = n$
9.	$261 - 29 = n$	$470 - 63 = n$
10.	$328 - 129 = n$	$476 - 267 = n$

Using a Calendar

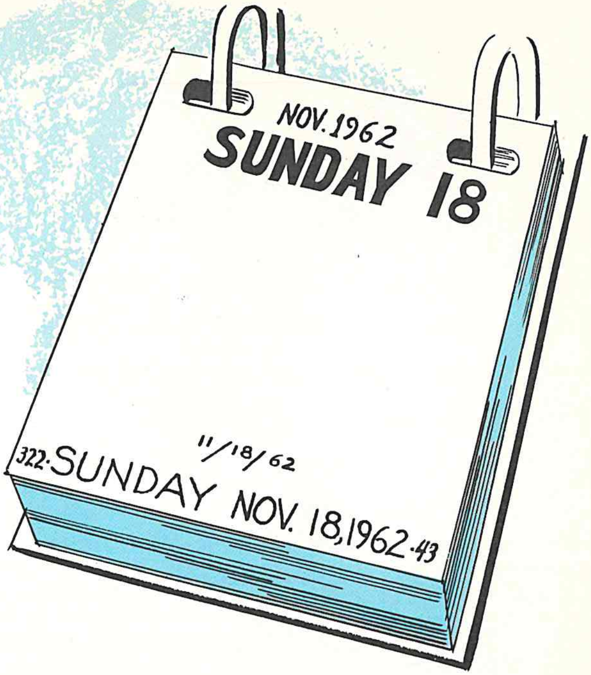
Robert's birthday is on a Sunday. The numerals at the bottom of the calendar page are important. The numerals 11/18/62 tell you that his birthday comes in the 11th month, on the 18th day, of the year 1962. The numeral 322 on the left side tells you that his birthday is on the 322nd day of the year. Do you see that the numeral 43 tells you how many more days are left in the year?

The information given on the table below will help you answer some of the questions on this page.

7 days (da.) = 1 week (wk.)
12 months (mo.) = 1 year (yr.)
52 weeks = 1 year
365 days = 1 year
366 days = 1 leap year

Oral Answer these questions. Tell the month, day, and year given below.

	a	*b*
1.	1/1/62	5/16/65
2.	3/7/67	12/10/63



Written Using numerals and slanted lines, write each of the following dates.

1. April 6, 1963
2. June 15, 1965
3. October 12, 1942
4. December 25, 1970
5. January 15, 1963

Write each statement below using words instead of their abbreviations. Supply the missing numeral in each statement.

	a	*b*
6.	3 wk. = ? da.	5 yr. = ? mo.
7.	5 yr. = ? wk.	3 yr. = ? da.

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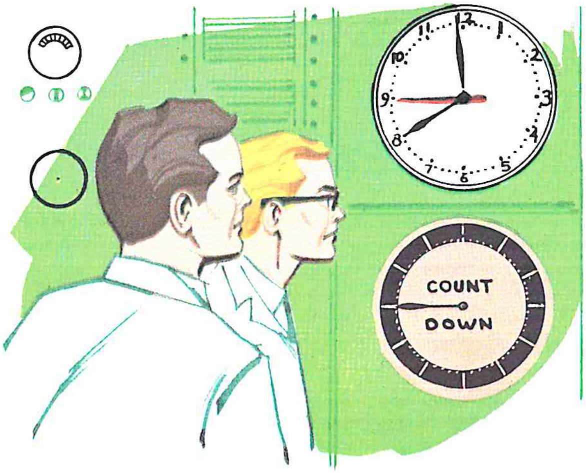
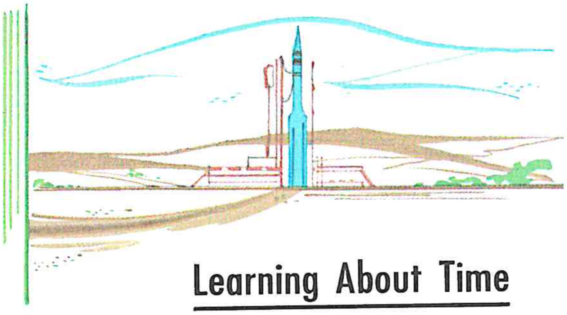


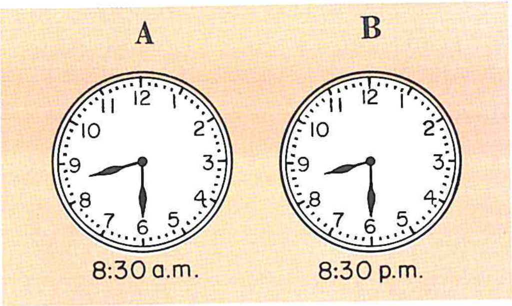


Learning About Time

The time shown on the clock is 15 seconds before 8 o'clock. The missile is to be launched at exactly 8 o'clock. Do you think it will be launched at 8 o'clock in the morning or 8 o'clock in the evening? Do you see that it is important to tell whether the time is morning time or afternoon time?

The beginning point for measuring time on a clock is 12 o'clock noon. The short way to write 12 o'clock noon is 12 m. The abbreviation m. comes from the word *meridies*, the Latin word for *middle of the day*, or *noon*.

Now look at the clocks below.



The letters a.m., which stand for *ante meridiem*, are used to tell you that the time shown on clock A is time before noon. The letters p.m., which stand for *post meridiem*, are used to tell you that the time shown on clock B is past noon, or after noon.

Oral Tell why you should use the abbreviations m., p.m., and a.m. when you write numerals that tell about time.

Written Follow these directions.

1. Write *three o'clock in the afternoon* and *seven o'clock before noon* using abbreviations.

Use words to write each of the following time statements. For 6 a.m. write: Six o'clock ante meridiem. What will you write for 4 p.m.?

	a	*b*	*c*
2.	6 a.m.	4 p.m.	8 p.m.
3.	9 a.m.	5 p.m.	1 a.m.
4.	10 a.m.	12 m.	3 a.m.
5.	11 p.m.	4 a.m.	12 p.m.

Learning More About Time

Look at the clock pictured at the right. As you see, it shows the time as 35 minutes after 10, or 25 minutes to 11. This time is usually written 10:35 and is read *ten thirty-five.* 2:13 is read *two thirteen.* 5:06 is read *five six.*

Oral Be ready to read the time for each of the following:

	a	*b*	*c*	*d*
1.	7:23	6:15	2:23	8:10
2.	1:45	9:05	5:57	11:08

Use the clock to help you find the answers to the following problems.

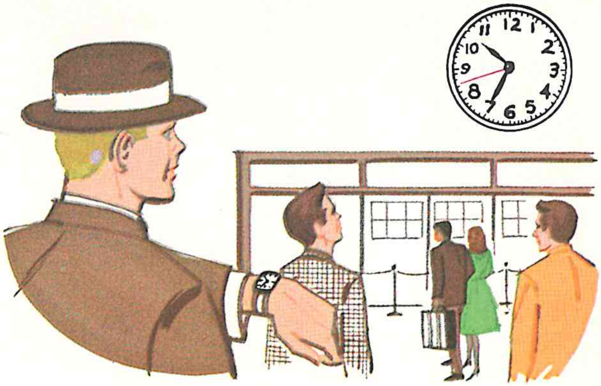
3. Helen is going to visit her aunt. The bus she will ride on leaves at 3:20 p.m. It is now 3:03 p.m. How long has Helen to wait?

4. Lunch was ready at 12 m. Bob was 13 minutes late. What time did Bob get home for lunch?

5. Jim goes home from school for lunch. He leaves school at 11:45 a.m. It takes him 20 minutes to get home. What time should Jim's mother plan to have lunch ready?

6. How many minutes will it be from 11:25 a.m. to 12:10 p.m.?

7. In 17 minutes it will be 4:30 p.m. What time is it now?



Written Use numerals to write the time when the clock shows the following:

	a	*b*
1.	Five eight	Six fifty
2.	Two forty-two	One thirteen

The chart below gives the *units of time* which are measured by a clock.

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)

Write each of the following statements using words instead of their abbreviations. Use the chart to help you supply the missing numeral in each one.

3. 6 min. = ? sec.

4. 4 da. = ? hrs.

5. 7 hrs. = ? min.

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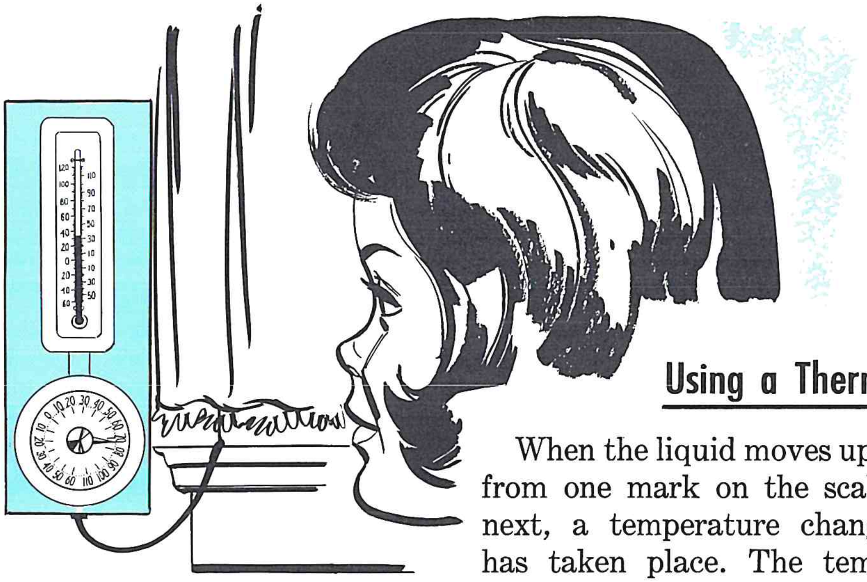


Using a Thermometer

The thermometers on this page measure the temperature in degrees. Do you see that the pointer on the indoor thermometer is at a point just to the right of 70? Each ten degrees is divided into spaces of 2 degrees. The temperature indoors is about 72 degrees. Write this temperature as 72°.

The pointer on the circular indoor thermometer moves to the right as the temperature rises. Do you see that it can measure a temperature as high as 110°? What is the lowest temperature it can measure?

The outdoor thermometer has a column of liquid in it. This column of liquid moves upward when the outdoor temperature rises. The column of liquid moves downward as the outdoor temperature falls.

When the liquid moves up or down from one mark on the scale to the next, a temperature change of 2° has taken place. The temperature shown on the outdoor thermometer is 32°.

Look at the scale of the outdoor thermometer. Find 0. Numerals on the scale run in both directions from 0. Numerals above the zero mark are used to read temperatures *above zero.* Numerals below the zero mark are used to read temperatures *below zero.*

Oral Answer these questions.

1. How is reading a thermometer like reading the numerals on a number line?

2. Why does the scale of a thermometer used in cooking begin at a higher point than an indoor thermometer?

Something to do Keep a temperature record of the indoor and outdoor temperature at the same time for each day in a week.

Keeping a Thermometer Record

The children in the fourth grade used a thermometer to keep a temperature record. The problems on this page tell some of the things that they did and some of the things that they learned.

Oral Find the answer to each question below. Be ready to tell what steps you took to find each answer.

1. The 13 boys and the 9 girls in the class took turns in keeping the temperature record. How many more boys than girls worked on the record?

2. One day in September the temperature was 72 degrees at 9 o'clock in the morning. By noon it had gone up to 91 degrees. How many degrees had it gone up?

3. On a cold day the temperature rose from 17 degrees at 9 o'clock to 29 degrees at 1:30. How many degrees did it rise?

4. The temperature was 51 degrees at noon on one day. By 3 o'clock it had dropped to 32 degrees. How much colder was it at 3 o'clock than at noon?

5. On a cold Wednesday the high temperature was 17 degrees. On Thursday the high was 30 degrees. How much colder was it on Wednesday than on Thursday?

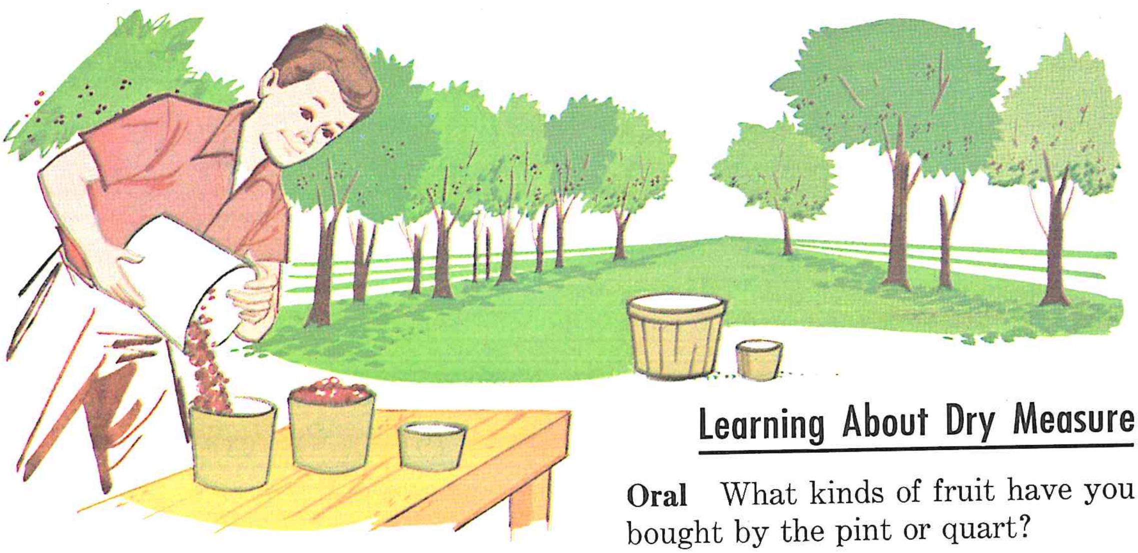
6. At noon on Friday the temperature was 47 degrees. At 3 o'clock it was 59 degrees. How much warmer was it at 3 o'clock than it was at noon?

7. Sharon told her father one day that the low temperature that day was 24 degrees by the thermometer at school. Her father said that it was 19 degrees by a thermometer where he worked. How much colder was it where her father worked than it was at school?

8. When the schoolroom temperature is 72 degrees and the outside temperature is 39 degrees, what is the difference between the outside and the inside temperature?

A quick review

	a	*b*	*c*	*d*
1.	5)97	9)52	7)64	4)$73
2.	231 ×7	119 ×3	333 ×9	$2.40 ×8
3.	709 −484	550 −225	964 −799	$8.55 −6.28
4.	574 290 135 +861	522 608 197 +23	5072 2468 93 +171	$19.88 6.23 76.45 +10.00



Learning About Dry Measure

Robert is separating the pail of cherries into units of 1 quart each. His measurement cannot be exact. It will depend upon how tightly he packs the cherries into the pails and upon how full he makes each pail. The pint, peck, and bushel containers shown in the picture are examples of other units of measure sometimes used in measuring fruits, grains, and vegetables.

Why are these units called units of **dry measure**? Why is it better to weigh fruits and vegetables than to measure them with pint, quart, peck, or bushel containers?

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Following is a table of equivalent dry measurements:

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Oral What kinds of fruit have you bought by the pint or quart?

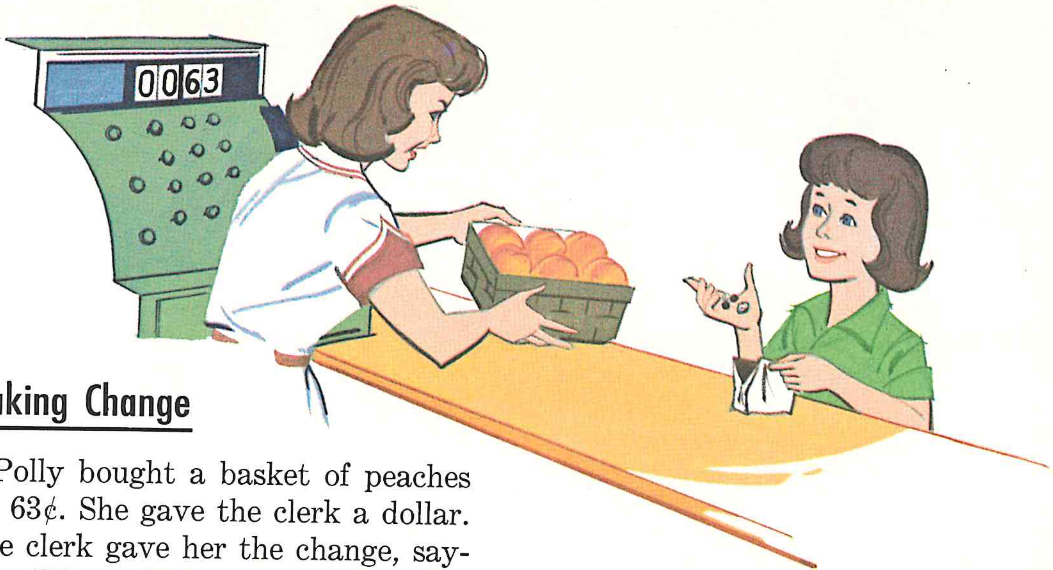
Written Write each statement below, using words instead of their abbreviations. Use the table on this page to help you supply the missing numeral in each statement.

	a	*b*
1.	2 qt. = ? pt.	2 pk. = ? qt.
2.	3 bu. = ? pk.	8 pt. = ? qt.
3.	16 qt. = ? pk.	12 pk. = ? bu.

Solve the following problems.

4. Mr. Martin picked a bushel of peaches. He wanted to put them into 1-quart baskets to sell at his roadside stand. How many quart baskets could he fill?

5. Tom and Jack helped their father pick apples. Tom filled a bushel basket and a peck basket. Jack filled 3 peck baskets. How much more did Tom pick than Jack?



Making Change

Polly bought a basket of peaches for 63¢. She gave the clerk a dollar. The clerk gave her the change, saying, "Sixty-three, sixty-four, sixty-five, seventy-five, one dollar."

Polly looked at her change. She had 2 pennies, 1 dime, and 1 quarter. Do you see that the clerk began with the cost of the peaches and added each time she gave Polly a coin until she had reached the dollar she had been given?

Oral Read the following problems. Be ready to answer each question.

1. Roy bought a melon for 19¢. He gave the clerk 50¢. As he gave Roy the change, the clerk said, "Nineteen, twenty, twenty-five, thirty, forty, fifty." How many pennies, nickels, and dimes did Roy get? What other change could the clerk have given him?

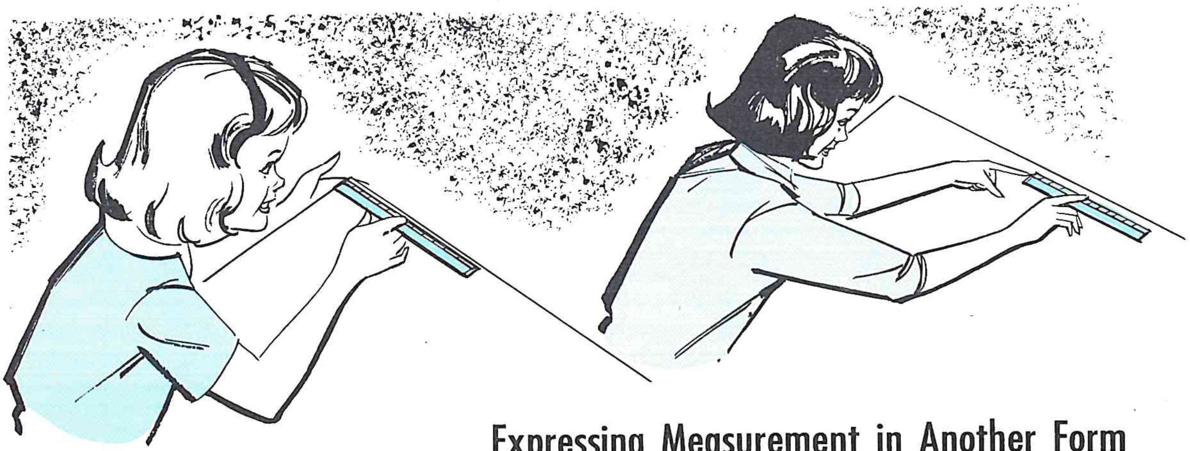
2. Sally bought a can of soup for 18¢ and gave the clerk a dollar. Can you tell what the clerk might have done and said?

3. John gave the clerk 50¢ for a can of pears that cost 29¢. What might the clerk have done and said?

4. Ellen bought some onions for 13¢. She gave the clerk a quarter. How might the clerk have given Ellen her change?

Written Copy and complete the table below. Reminder: Change should be given using the fewest possible coins.

Cost	Money given to the clerk	Coins in change
$ .98	$5.00	____
1.29	2.00	____
.16	.50	____
.51	1.00	____



Expressing Measurement in Another Form

Linn said, "My desk is 28 inches wide." Joanne said, "My desk is 2 feet 4 inches wide." Both desks are equally wide. Each girl gave the measurement in a different form. Do you see that different forms can have the same values?

To express the length of 2 feet 4 inches as inches, think: Each foot has the length of 12 inches. Then you can multiply and add as shown below.

2×12 inches = 24 inches
24 inches + 4 inches = 28 inches

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Do you see that you can change the form of feet and inches to inches by using multiplication and addition?

Oral Answer these questions.

1. How would you change the form of yards and feet to feet only? Of yards and inches to inches only?

2. How would you change the form of pounds and ounces to ounces only?

3. How would you change the form of gallons and quarts to quarts only?

Written Copy. Replace each question mark with the missing numeral.

1. 1 ft. = ? in.
2. 1 gal. = ? qt.
3. 2 ft. 6 in. = ? in.
4. 5 yd. 8 in. = ? in.
5. 3 gal. 2 qt. = ? qt.
6. 1 yd. = ? in.
7. 1 qt. = ? pt.
8. 3 yd. 1 ft. = ? ft.
9. 10 yd. 2 ft. = ? ft.
10. 3 qt. 1 pt. = ? pt.

Read each of the following problems. Decide which unit of measure should be changed. Then solve the problems.

11. Delores is 5 feet 3 inches tall. Her father is 73 inches tall. How many inches shorter is Delores than her father?

12. A blotter that is 28 inches long is to be put in the center of a desk that is 5 feet 4 inches long. How much shorter is the blotter than the desk?

13. John has a board that is 2 feet 4 inches long. He wants to cut a piece of board from it that is 18 inches long. How many inches of board will be left?

14. Patsy is 4 feet 9 inches tall. How many inches tall is she?

15. Allen picked 42 ears of corn. He sold 3 dozen of them. How many ears of corn did he have left?

16. Don measured one side of the playground. It was 35 yards and 2 feet long. How many feet of fence will be needed for this side?

17. Charles mows the lawn in his yard in 1 hour and 20 minutes. Paul mows his lawn in 70 minutes. How much longer does it take Charles than Paul?

18. The Smiths use 9 gallons and 3 quarts of milk each week. How many quarts of milk a week do they use?

19. Joe's father needs 16 yards and 2 feet of electric cord. How many feet of cord does he need?

20. The distance around Ben's garden is 8 yards and 1 foot. How many feet of fence wire does he need to fence the garden?

21. Mr. Bates needs 9 yards of wire. At 4¢ a foot how much will he have to pay for the wire?

22. Ted and his father filled 8 bushel baskets and 19 peck baskets with potatoes. How many pecks of potatoes did they use altogether to fill the baskets?

23. Mrs. Baker bought 3 quarts and 1 pint of milk one day and 5 pints the next day. How much more milk did she buy the first day than the second?

24. Joan's mother used 1 pound and 4 ounces of butter to bake cookies and 8 ounces to bake a cake. How many ounces of butter did she use in all?

25. 65 quarts and 65 pints equal how many pints?

Reviewing Addition, Subtraction, Multiplication, and Division

On this page you will find out whether you need more help with addition, subtraction, multiplication, or division.

Part 1 Copy. Find each sum. Check by adding again.

	a	*b*	*c*	*d*
1.	9 8 +7	8 4 +8	13 71 +15	$.17 .42 +.03
2.	817 14 +200	67 310 +711	486 981 +307	$5.03 7.19 +.32
3.	3067 938 739 +1110	290 579 3102 +1937	1405 2066 2013 +8032	$60.00 24.50 94.02 +18.99

Part 2 Copy. Find each difference. Check by adding.

	a	*b*	*c*	*d*
1.	9 −3	17 −8	22 −4	$.61 −.08
2.	72 −42	53 −24	257 −90	$1.76 −.57
3.	305 −267	833 −579	3610 −528	$14.40 −9.35
4.	9874 −3127	3000 −1222	3689 −1418	$57.69 −42.79

Part 3 Copy. Find each product. Check by multiplying again.

	a	*b*	*c*	*d*
1.	9 ×5	6 ×7	24 ×2	$.60 ×8
2.	67 ×3	95 ×4	27 ×7	$.99 ×6
3.	321 ×2	928 ×5	414 ×8	$1.97 ×9
4.	905 ×5	277 ×7	909 ×4	$8.27 ×6

Part 4 Write each division below, using the sign ⟌. Find each quotient. Check by multiplying.

	a	*b*
1.	24÷6=n	18÷9=n
2.	36÷9=n	35÷5=n
3.	48÷6=n	54÷9=n
4.	63÷7=n	72÷8=n
5.	82÷9=n	67÷8=n
6.	19÷6=n	26÷4=n
7.	34÷5=n	55÷9=n
8.	19÷2=n	27÷4=n
9.	47÷7=n	33÷4=n

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. Standard units of measure are the inch, the gallon, and the pound. Their size was set by law. (113)

2. Measuring is done by applying standard units of measure to the quantity to be measured. (113)

3. The lines that mark off equal spaces on a ruler, weighing scale, thermometer, or line drawing are called the scale. (114)

4. Measurement can never be exact. (113, 115, 116, 126)

Words to Know

1. Units of measure, standard units of measure (113)

2. Linear measures, scale, equidistant (114)

3. Segments (119)

4. Dry measures (126)

Questions to Discuss

1. What units of measure are used to measure length? (114, 115, 116) Liquids? (118) Weight? (119) Time? (121, 122, 123) Temperature? (124) Fruit, grains, and vegetables? (126)

2. Why must measurement be made as carefully as possible? (113)

3. How can you use a foot ruler to measure an object that is more than 12 inches long? (114)

4. How do you measure length to the nearest quarter inch? (116)

Written Practice

Write each statement below, using words instead of their abbreviations. Supply the missing numeral or numerals in each statement.

1. 36 in. = ? ft. or ? yd. (115)

2. 5280 ft. = ? yd. or ? mi. (115)

3. 1 gal. = ? qt. or ? pt. (118)

4. 2000 lb. = ? T. (119)

5. 12 mo. = ? yr. or ? wk. (121)

6. 4 pk. = ? bu. or ? qt. (126)

7. 2 mi. = ? ft. or ? yd. (115)

8. 5 yd. = ? in. or ? ft. (115)

9. 4 gal. = ? qt. or ? pt. (118)

10. 6 yr. = ? mo. or ? wk. (121)

Self-Evaluation

Part 1 Copy. Write each quotient, sum, difference, or product.

	a	*b*	*c*	*d*
1.	9)63	7)56	8)48	6)54
2.	9)83	8)68	6)19	7)54
3.	5078 3256 439 +5643	2198 3056 6798 +3214	6792 9851 1432 +4576	$45.98 9.79 .85 +15.25
4.	9679 −4852	7634 −2582	8431 −4254	$60.01 −34.55
5.	725 ×6	545 ×7	909 ×9	$4.50 ×5
6.	670 ×8	928 ×3	199 ×4	$8.29 ×6

Part 2 In each statement below write the word in ( ) that is needed to make the sentence correct.

1. You would be most likely to choose a (yardstick, foot ruler, six-inch ruler) to measure the length of your arithmetic book.

2. The tenth month in the year is (August, September, October).

3. The time when school is most likely to commence is (9 a.m., 12 m., 9 p.m.).

4. The scale of an outdoor thermometer most likely begins at (0°, a point below 0°, a point above 0°).

5. When berries are 29¢ a pint, a sensible price for a quart of berries would be (55¢, 40¢, 15¢).

Part 3 Write the equation you would use to solve each problem below. Solve the equation. Write the correct answer.

1. Don and his father drove 319 miles on Saturday and 396 miles on Sunday. How much farther did they drive on Sunday than on Saturday?

2. A playground was 95 yards long. What was its length in feet?

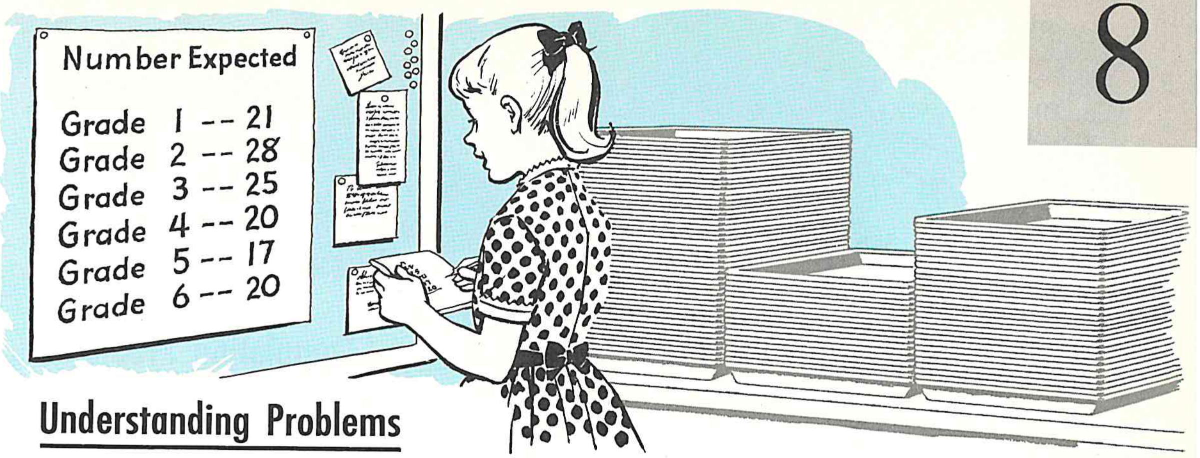
3. A roll of ribbon held 72 feet of ribbon. How many yards of ribbon were on the roll?

4. The Johnsons' speedometer read 21,507 when they began a vacation trip. Upon their return the speedometer read 23,409. How far had they driven?

5. A truck was loaded with 5 tons of grain. What was the weight of the grain in pounds?

6. How many quart bottles can be filled from a 10-gallon can?

8



Understanding Problems

As you can see from the picture, Mary has a problem to solve. She wants to know how many trays she needs if she is to have enough for all of the pupils expected. What information can she use in solving the problem? What might she do with the information? How many trays does she need?

Read the problems below. Does each one give the information needed to answer the question that is asked?

1. The paper plates come in packages of 24 each. The girls bought 3 packages. How many paper plates did they have?

2. The boys have 24 chairs and will put them around 6 tables, with the same number of chairs at each table. How many chairs will be at each table?

Paragraphs 1 and 2, which you have just read, are problems. They give information telling how many of something, and they ask a question that can be answered either by joining the objects to form a larger set, or by separating the objects into smaller sets. How is the question in each problem related to the statement in it?

Oral Answer these questions.

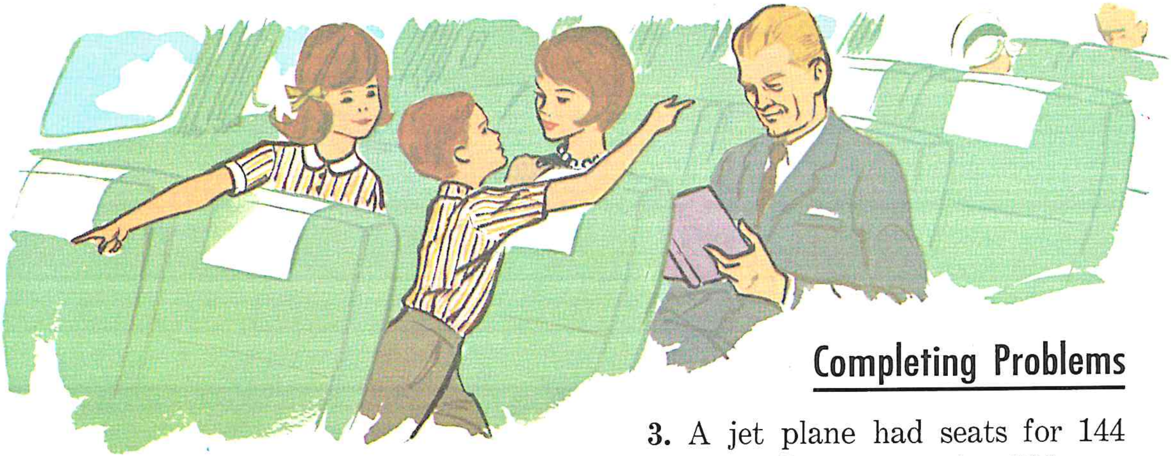
1. What objects in problem 1 are both told about and asked about?

2. What objects are told about and asked about in problem 2?

3. To answer the question in each problem, what would you do with the numbers that stand for the objects?

4. How would you express problem 1 as an equation to solve it? How would you express problem 2?

5. How would you check the accuracy of your answers to the equations in problems 1 and 2?



Completing Problems

The statements on this page were taken from problems. You are to supply a question for each problem. Be sure that the objects named in the question are related to those in the statement.

The signs +, −, ×, and ÷ in ( ) after each statement below tell whether your question should lead to an equation that can be solved by using addition, subtraction, multiplication, or division.

Write the equation for each of your problems. Solve the equation. Check to see if your answer is sensible.

1. Jerry's father traveled 375 miles going from his home to Chicago. He drove another 83 miles before stopping at a motel for the night. (+)

2. An airplane flew 475 miles an hour. It flew for 4 hours without stopping. (×)

3. A jet plane had seats for 144 passengers. It was carrying 129 passengers. (−)

4. Mary had a shell collection. She gave away 25 shells and had 119 shells left. (+)

5. Doris had 96 stamps to paste on 8 pages with the same number of stamps on each page. (÷)

6. Roger had 48 bulbs to put into baskets. He put 8 bulbs into each basket. (÷)

7. Laura had 115 buttons in a collection. She lost some buttons and had only 89 left. (−)

8. Each crate of berries held 24 boxes. A truck driver took 9 crates of berries into a store. (×)

9. One tank held 1750 gallons of gasoline. Another tank held 1575 gallons of gasoline. (+ or −)

10. A storekeeper ordered 8 boxes of pencils. Each box held 144 pencils. (×)

Supplying Missing Information

The first step in solving a problem is to read it carefully. If some information is missing, you will need to supply it before you can solve the problem.

Read the problem below. What information is missing?

Robert has a board 12 feet long and just the right width for building birdhouses. How many birdhouses can he build if he uses all of the board?

You do not know how many feet of board Robert needs for one birdhouse. Therefore you cannot solve the problem. What would be a sensible number to supply?

Oral Read each problem below. Decide if some information is missing. If so, supply sensible information. Reminder: The information in both the statement and the question must be related. Remember, too, that the money words *dollars* and *cents* are never part of the equation. They are used in the answer only.

1. Donald wants to buy a football. He has \$3.98. Can he buy the football?

2. Sally made 8 tickets from a sheet of paper. Can she make 96 tickets?

3. Doris has a spool of ribbon that has 36 yards of ribbon on it. She needs 3 yards of ribbon for each costume. Has she enough ribbon to make costumes for 9 girls?

4. Betty Jean wants to divide her candy equally among 6 of her friends. How many pieces will each of the 6 girls get?

5. Dan has 165 stamps in his collection. How many more stamps has Dan than Bob?

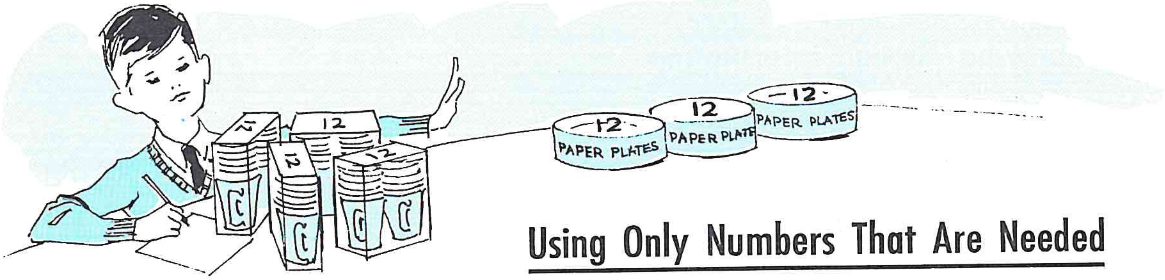
6. A truck driver plans to drive 35 miles an hour. How far can he drive in 7 hours if he drives as he plans to?

7. The population of a city is now 37,458. How much did the population increase in 10 years?

8. Mary Jo needs \$11.98 to buy a dress. She has \$9.95 in her bank. How much more money does she need?

9. A service station sold 85 tires. How many tires did the station sell each week?

Written Write an equation for each problem above, using information which you supplied. Solve each equation. Check to see if your answer is sensible. Then write the answer.



Using Only Numbers That Are Needed

Some problems may give information you do not need to use in solving the problem. Do not let yourself be fooled by such problems. Find the number or numbers you do not need in solving the problem below.

John bought 36 paper plates and 4 boxes of paper cups with 12 paper cups in a box. How many paper cups did he buy?

The paper cups are named in the statement and in the question. Use only the numbers telling about the paper cups in answering the question. Why? What is the equation for the problem? What is the answer to the problem?

Oral Read each problem below carefully. Decide which objects in the statement are related to the objects named in the question. Tell the equation to use in solving each problem.

MORE PRACTICE PAGE 307

1. A milkman delivered 75 quarts of milk and 4 cases of half-pint cartons with 24 half pints in a case. How many half-pint cartons of milk did he deliver?

2. The speedometer on Mr. Bacon's car read 23,578 when he began a trip. He drove 487 miles on Monday, 396 miles on Tuesday, and 435 miles on Wednesday. How far did he drive on all three days?

3. Bob's father bought one city lot with a width of 57 feet and a lot next to it with a width of 75 feet. Each lot was 150 feet deep. What was the width of the two lots together?

4. Jack helped his father put 96 boxes of berries into 4 cases with the same number of boxes in each case. How many boxes of berries did they put into each case?

5. A traffic counter showed traffic on three days as follows: Friday, 2785 cars; Saturday, 1998 cars; Sunday, 1468 cars. How many more cars were counted on Friday than on Sunday?

Written Write an equation for each problem above. Solve each equation. Read the problem again to see if your answer is sensible. Then write the complete answer.

Problems with More Than One Operation

Look at the equation below.

$$165-(24+35)=n$$

To solve it, you must add and you must subtract. Which operation must you do first? Why?

The above equation came from the following problem.

Bob gave 24 of his stamps to Jim and 35 to Michael. He had 165 stamps before he gave any to Jim and Michael. How many stamps did he have left?

You can solve the equation $165-(24+35)=n$ in steps, like this:

Step 1—Add	Step 2—Subtract
$\begin{array}{r}24\\+35\\\hline 59\end{array}$	$\begin{array}{r}165\\-59\\\hline 106\end{array}$

Oral Read each problem carefully. Try to *see* the whole situation. Tell which equation or equations you would use in solving each problem. Reminder: The words *dollars* and *cents* are needed only in your final answer, not in the equation.

1. Judy spent 16¢ for an ice cream cone, 8¢ for candy, and 25¢ for a notebook. She had 75¢ when she left home. How much money should she still have?

2. Mary read 53 pages of her 120-page book in the morning. In the afternoon she read another 17 pages. How many pages does she still have to read?

3. The members of one Scout troop sold 64 boxes of cookies. The members of another troop sold 78 boxes. The two troops had hoped to sell 150 boxes of cookies. How many more boxes must they sell if they do as well as they had expected to do?

4. Dick gathered 61 eggs on Monday and 65 eggs on Tuesday. He needs 144 eggs to fill a case. How many more eggs must he have before the case is filled?

Written Write the equation for each problem above. Solve the equation. Read the problem again to see if your answer is sensible. Then write the complete answer.

A quick review

1. 15 pk.+3 qt.=___qt.

2. 5 mi.+300 yd.=___yd.

3. 12 pt.+6 c.=___c.

How would you solve the equation $2\times(35+59)=n$? You should add the numbers inside of the ( ) first. Then the equation becomes $2\times94=n$. The value of n is 188.

The equation $2\times(35+59)=n$ came from the problem below.

Mary's father said, "Mary, I will give you as much money as you can save in the next two weeks." Mary saved 35¢ one week and 59¢ the next week. Then her father gave her the money he promised. How much money did Mary have then?

Mary had $1.88.

When making up equations for problems with two operations think, "Which operation will I do first?" Use ( ) around the numbers you use in this operation.

Oral Be ready to tell which equation you would use in solving each of the following problems. Use the words *dollars* and *cents* in the answer, not in the equation. Think of the numbers that stand for money as being pennies when you write equations for problems 2, 3, 4, and 5.

1. Roy's father told Roy and Tom that he would buy as many Christmas seals from them as they could sell together. Roy sold 125 seals and Tom sold 89 seals. How many Christmas seals will they have sold altogether after their father buys the seals he promised to buy?

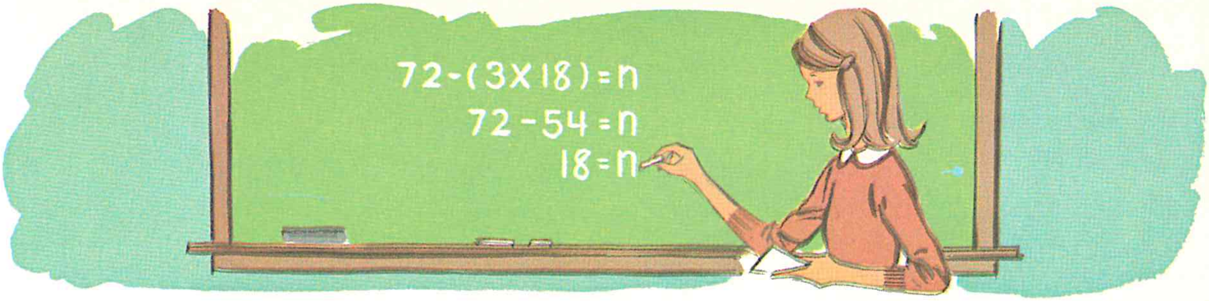
2. Janet saved $.65 one week and $1.89 the next. Then she spent $.98 of her savings for a game. How much of her savings did she have left?

3. Mary Ann saved $1.15 in January and $1.35 in February. In March she plans to save as much as she saved in the other two months together. If she does, how much money will she have saved by the end of March?

4. Alex spent $2.35 for a shirt, $.50 for a handkerchief, and $1.19 for a tie. How much change should he get from $5?

5. Bonnie had $10. She spent $2.75 for a book, $.35 for paper, $.35 for a roll of film, and $.25 for ink. How much of her $10 should she have left?

Written Write the equations for each problem above. Solve the equation. Read the problem again to see if your answer is sensible. Check your complete answer to see if it is correct. Then write it.



Using Multiplication and Subtraction in Solving Problems

The equation which Mary is solving on the board came from this problem:

Mary had a spool of ribbon with 72 inches of ribbon on it. She wanted to make 3 badges, using 18 inches of ribbon for each badge. How much ribbon should she have left?

You are to think of equal groups as being together; so you are to multiply 18 by 3. You are to think of 72 as separated; so you are to subtract some number from 72.

The equation $72-(3\times18)=n$ contains all of the information needed in solving the problem. The answer to the problem is 18 inches.

Oral Be ready to tell the equation you would use in solving each problem that follows, and also how you decided upon the equation.

1. Mrs. Baker had $2.50 in her purse. She bought 3 yards of braid that cost 23¢ a yard. How much money did she have left?

2. Edwin had $5.00. He bought 3 dozen eggs for his mother at 69¢ a dozen. How much money did he have left?

3. A farmer wanted to fill 6 cartons with eggs. Each carton would hold 12 eggs. He had only 63 eggs. How many more eggs did he need to fill the cartons?

4. Roy had a basket containing 40 pounds of apples. From the basket of apples Roy filled 6 paper bags that held 5 pounds each. How many pounds of apples were left in the basket?

Written Write the equation for each of the problems above. Solve each equation. Write the answer to the problem.

Something to do Write problems of your own that could be solved by using the equations below.

	a	*b*
1.	$3\times(42+36)=n$	$75-(16+8)=n$
2.	$95-(3\times30)=n$	$6\times(12+18)=n$

More Problems Solved with Two Operations

At a roadside stand Ronald sold 9 bags of potatoes weighing 15 pounds each, and a bushel of potatoes that weighed 60 pounds. How many pounds of potatoes did he sell?

You cannot answer the question until you know how many pounds of potatoes were in all 9 bags. You are to think of equal sets as being joined; so you multiply the numbers. You are also to think of two sets as being together; so you are to add numbers.

The equation is $(9\times15)+60=n$. How would you solve it?

Oral Read each problem carefully. Be ready to tell the equation you would use in solving it and why you decided to use that equation.

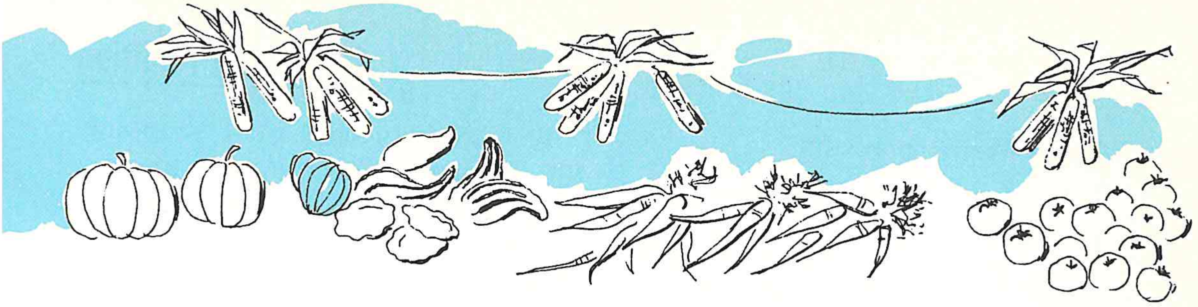
1. Ronald sold 8 cases of berries with 24 boxes in each case, and he also sold 23 single boxes of berries. How many boxes of berries did he sell altogether?

2. Sally bought 4 yards of material at 79¢ a yard and some buttons for 29¢. How much money did she spend? (Hint: Think of the money as being in pennies when you decide upon the equations to use.)

3. Irwin's mother bought 3 pounds of steak at $1.08 a pound and a pound of bacon for $.89. How much did she spend for meat?

Be ready to make up a problem that could be solved by using each equation below.

	a	*b*
1.	$(5\times25)+80=n$	$(3\times12)+45=n$
2.	$62-(5\times10)=n$	$85-(6\times3)=n$
3.	$75-(16+7)=n$	$30-(8+6)=n$



Written Read each of the following problems carefully. Decide which information is needed in writing an equation for the problem and how the information should be given. Write the equation. Solve it.

Go over the problem again to see if your answer is sensible. Then write your answer.

1. Carla has a library book with 162 pages to read. She read 29 pages during the day and 15 pages in the evening. How many more pages does she still have to read?

2. A class plans to send out 150 invitations to a school circus. Each girl on a committee of 4 girls agreed to make 8 invitations. How many invitations will have to be made by other people?

3. Alex has $3.65 in his bank. He earned $3.25, which he put into his bank. He used $1.98 of the money for a shirt. How much of his money was left?

4. Judy sold 7 children's tickets to the school play at 35¢ each, and a ticket to her mother for 75¢. How much money should Judy have received for the tickets?

5. Terry had $3.69. He earned 75¢. How much more money does he need before he can buy a baseball glove that sells for $5.00?

6. Mrs. Case bought 6 yards of material at $1.19 a yard and gave the clerk $10. How much change should the clerk give Mrs. Case?

7. Ann's father had a library of 185 books. He bought a set of 24 books to add to his library. Ann has 17 books in her library. How many more books has Ann's father than Ann?

8. Dick pulled enough carrots from his garden to make 8 bunches, which he planned to sell at 25¢ a bunch. He sold all but 2 bunches of carrots. How much money did he get for the carrots he sold?

9. Betty bought a bicycle tire for $2.39 and a flashlight for 98¢. How much change should she get from $5.00?

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Reviewing Addition

Copy. Write each sum.

	a	*b*	*c*	*d*
1.	229 36 +27	715 24 +37	27 30 +491	32 600 +20
2.	970 13 +65	679 35 +65	$9.85 .75 +.67	928 36 +90
3.	865 89 53 +537	996 88 67 +657	65 87 996 +886	975 93 74 +212
4.	659 425 38 +795	$4.29 3.15 .70 +1.03	978 98 46 +647	68 945 72 +358
5.	6162 9377 +8344	4505 7295 +6666	1211 2175 +4286	4325 5592 +7487
6.	9958 493 2782 +3149	2465 398 182 +9849	$74.50 85.29 76.75 +80.85	5869 8671 9576 +3294

Write an equation for and solve each of these problems. Remember: The signs $ and . are used only in the final answers. They are not used in the equations.

7. Lucy bought a dress for $4.95 and a hat for $2.98. How much did she pay for both?

8. Carol's mother went shopping. She spent $4.68 at the meat market, $3.50 at the grocery store, and $1.57 at the bakery. How much did she spend in all?

9. On a trip Ted's father drove 275 miles the first day, 370 the second day, 380 the third day, and 280 the fourth day. How far did he drive in the four days?

10. Sue read one book of 120 pages, another of 92 pages, and a third of 168 pages. How many pages in all were there in the three books?

11. Edward's father paid $8.75 for a hat, $3.25 for a shirt, and $16.50 for a pair of shoes. How much did he pay for all three?

12. A cafeteria in a large city served 3470 meals on Monday, 2995 meals on Tuesday, and 3138 meals on Wednesday. How many meals were served on all three days?

13. Last summer the Community Club gave swimming lessons to 209 boys and 127 girls. How many in all took lessons at the Club?

14. This summer 351 boys and girls have signed up for lessons. The Club has set a goal for an enrollment of 375. How many more must enroll to reach this number?

Reviewing Subtraction

Copy. Write each difference.

	a	*b*	*c*	*d*
1.	96 −29	29 −19	88 −14	$.73 −.45
2.	54 −37	30 −17	67 −58	$.85 −.68
3.	366 −48	652 −39	429 −45	$1.50 −.86
4.	605 −27	500 −73	300 −20	$1.03 −.68
5.	665 −241	748 −525	217 −144	$3.55 −2.82
6.	730 −529	651 −436	540 −305	$2.45 −1.36
7.	3250 −175	4300 −177	1402 −234	$46.20 −4.86
8.	8710 −4392	8405 −3107	7503 −4276	5203 −3179

Write the equation for and solve each of these problems.

9. Ben bought a baseball priced at $1.39. How much change should he get from $5.00?

10. Everett bought a softball that was marked down from $2.25 to $1.98. How much did he save by buying at the reduced price?

11. At a bookstore Ellen saw a book that she would like to buy. It cost $2.00. She had only $.84. How much more money did she need to buy the book?

12. Frank bought a storybook that cost $1.65. How much change should he get from $2.00?

13. Mary had $.75 and spent $.29 for lunch. How much money did she have left?

14. There were 103 people at the school pageant on Friday and 141 on Saturday. How many more people came on Saturday than on Friday?

15. The auditorium seats 200 people. When the program started there were 67 vacant seats. How many people attended the program?

16. Barbara has $5.64 in her bank. She wants to buy a camera that costs $7.50. How much more does she need?

17. Donald had $1.25 when he went to the carnival. He had $.35 left when he came home. How much did he spend at the carnival?

18. Mr. Nelson had 3100 bushels of wheat to sell. He sold 2250 bushels to the grain elevator. How many bushels did he have left to sell?

Reviewing Multiplication and Division

Part 1 Copy. Find each product. Check by multiplying again.

	a	*b*	*c*	*d*
1.	82 ×2	41 ×6	83 ×3	31 ×3
2.	52 ×4	71 ×5	62 ×3	43 ×2
3.	34 ×2	60 ×6	56 ×3	73 ×6
4.	39 ×2	53 ×7	66 ×9	14 ×5
5.	29 ×7	57 ×8	37 ×8	19 ×4
6.	153 ×6	348 ×2	618 ×4	273 ×3
7.	503 ×7	387 ×5	492 ×2	234 ×7
8.	\$.42 ×2	\$.81 ×6	\$.53 ×8	\$.09 ×5
9.	\$1.12 ×4	\$6.72 ×4	\$5.25 ×9	\$5.30 ×3

Part 2 Copy. Find each quotient.

	a	*b*	*c*	*d*
1.	$4\overline{)28}$	$3\overline{)27}$	$5\overline{)35}$	$8\overline{)48}$
2.	$4\overline{)36}$	$7\overline{)63}$	$6\overline{)54}$	$7\overline{)49}$
3.	$7\overline{)45}$	$7\overline{)66}$	$4\overline{)30}$	$8\overline{)54}$
4.	$6\overline{)60}$	$2\overline{)80}$	$3\overline{)90}$	$8\overline{)80}$

Part 3 Write the following, using the sign $\overline{)\quad}$. Find each quotient and remainder.

	a	*b*
1.	$84 \div 2 = n$	$96 \div 3 = n$
2.	$57 \div 5 = n$	$68 \div 6 = n$
3.	$88 \div 9 = n$	$76 \div 9 = n$

Part 4 Write the equation for each problem below. Solve each problem.

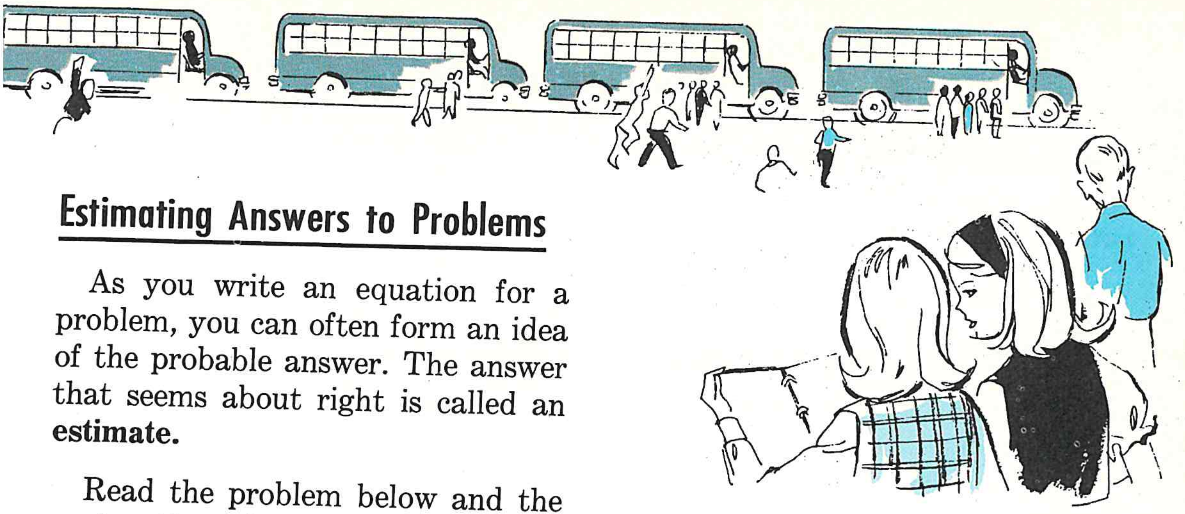
1. How much does each orange cost if 6 cost 30¢?

2. Mary Helen had 40¢. How many sweet rolls could she buy at 6¢ each? How much money would she have left?

3. A jet airplane flew 475 miles an hour for 3 hours. How far did it fly?

4. Tom and his two brothers got cameras for Christmas. Each camera cost \$9.78. How much did all three cameras cost?

5. Tom bought 6 rolls of film at \$.35 a roll. How much did he pay for film?



Estimating Answers to Problems

As you write an equation for a problem, you can often form an idea of the probable answer. The answer that seems about right is called an **estimate.**

Read the problem below and the explanation of how the answer was estimated.

Each of the 4 school buses could carry 48 children. How many children could all 4 buses carry?

Equal groups of 48 each are to be combined, and so you multiply 48 by 4. The equation is $4 \times 48 = n$.

48 is almost 50. $4 \times 50 = 200$. The estimated answer is *almost 200*. What is the exact answer?

Oral Read each problem carefully. Decide upon an equation for it. Then round off the numbers to be multiplied to the nearest multiple of ten and estimate an answer. Be ready to tell your estimate and how you made it.

1. Each classroom in a school has seats for 32 children. How many children could be seated in the 9 classrooms in the school?

2. Mr. Allen packed 6 cases of eggs with 144 eggs in each case. How many eggs did he use?

3. Mr. Hoffman drives 198 miles each week going to and from his work. How far does he drive in going to and from work in 5 weeks?

4. An airplane flew for 6 hours. If it flew 395 miles an hour, how many miles did it fly?

5. A storekeeper sold 8 refrigerators at $298 each. How much did he get for the refrigerators?

Written Write an equation for each problem above. Reminder: The sign $ is not to be included in the equation. Write an estimated answer to the problem. Solve each equation. Compare the value of it to your estimated answer. Go over the problem again to see if your answer seems sensible. Write each answer.

Estimating Answers in Addition and Subtraction

Bruce has 39 pennies and Kenneth has 36. How many pennies do the two boys have altogether?

You know that the answer will be larger than 39 or 36 because the sum is always equal to all the addends together. You see that there are 3 tens in each addend; so your answer will be at least 60. However, 39 is almost 4 tens, and 36 is closer to 4 tens than to 3 tens. Therefore your answer will be closer to 80 than to 60. When you solve the problem, you see that the answer is 75 pennies.

David had 84 stamps. He pasted 48 of them in his stamp book. How many did he have left?

84 can be rounded off to 80, and 48 to 50. The difference will be less than 4 tens, because when you subtract 5 tens from 8 tens, the difference is 3 tens. When you solve the problem you find that the difference is 36, which is less than 40.

What would be a good estimate for the sum of 48 and 29? Of 77 and 87?

Oral For each of the following problems select the *estimated* answer which you think will be nearest the *exact* answer. Then solve the problem to find the exact answer. Tell how you estimated the answer. If you did not select the best estimated answer, find out why you were wrong.

1. Jack's father is 35 years old. Jack is 9. What is the difference between their ages? (13 yr., 25 yr., 45 yr.)

2. Ellen had $.38 in her bank and earned $.25 by raking leaves in the yard. How much money did she have then? ($.40, $.60, $.80)

3. June bought a speller for $1.03 and a reader for $1.45. How much did June pay for both of the books? ($2.50, $1.50, $3.50)

4. At the food market, Susan's mother paid $2.90 for meat, $1.50 for vegetables, and $.50 for bread. How much did she spend in all? ($5, $7, $9)

5. Steve's father drove to a city 586 miles away. The first day he drove 389 miles. How much farther did he have to drive? (90 mi., 20 mi., 250 mi.)

Written Write an equation for each problem above. Write an estimated answer to the problem. Solve each equation. Compare the value of n to your estimated answer. Go over the problem again to see if your answer seems sensible. Then write each answer.

Practice in Estimating Answers

Read carefully each problem below. Think about the situation and what you would do to find each answer.

Oral Answer these questions about each problem:

1. Would I combine sets? (If so, I would either add or multiply the numbers.)

2. Would I separate a total amount into parts? (If so, I would subtract or divide the numbers.)

3. Would I compare sets to see by how many one set is greater than the other? (If so, I would subtract the numbers.)

Written Write an equation and an estimated answer for each problem below. Then solve each problem.

1. The fourth-grade children had $8.75 in their treasury. They spent $.80 for a scrapbook. How much money did they have left?

2. Betty's mother bought 3 house dresses at $3.98 each. How much did all the dresses cost?

3. Peter passed out two sheets of colored paper to each of the 27 pupils in the class. How many sheets of paper did he need?

4. Tom wants a baseball glove that costs $3.85 and a baseball bat that costs $1.89. He has $.69. How much more money does he need?

5. Betty bought a dozen eggs for $.60 and a magazine for $.27. How much change should she get from $1.00?

6. Ann's mother had $6.49 in her purse. She spent $.85 for meat. How much money did she have left?

7. Dick spent $.75 for a pen, $.25 for paper, and $.10 for an ink eraser. How much change should he get from $1.25?

8. Don needs $1.50 to buy a ball. He has saved $.99. How much more money does he need?

9. Laura's mother bought a 9-pound ham at $.67 per pound. How much change should she receive from $7.00?

10. Sam has 25¢ to use for buying 4¢ stamps. How many stamps can he buy and how much money will he have left?

11. Tom needed 110 stamps to fill his stamp book. One week he bought 25 stamps and his uncle gave him 40 stamps. How many more stamps does Tom need?

Writing Answers Only

Try to find the answer for each problem below without writing anything but the answer. For the first problem think 4×8=32. Write the answer, 32 books. Be ready to give the answer for any of the problems below.

1. There are 8 books on each of 4 shelves. How many books are there in all?

2. Ben bought a fountain pen for \$.92 and a pad of writing paper for \$.08. How much money did he spend altogether?

3. Tom bought a ruler for 5¢, a pencil for 4¢, and a small note pad for 6¢. How much did he spend?

4. Esther had a quarter. She paid 11¢ for an ice cream cone. How much did she have left?

5. If 4 apples cost 16¢, how much does one apple cost?

6. Joe bought a geography book that cost \$1.75. How much change should he receive from \$2?

7. A card of buttons has 4 rows of buttons with 3 buttons in each row. How many buttons are there on the card?

8. Barbara had 50¢ on Monday morning. She spent 10¢ on Monday and 20¢ on Tuesday. How much money did she have left?

9. Harold has 23¢ and wants to buy as many 4¢ stamps as he can. How many stamps can he buy and how many cents will he have left?

10. How many cents are $\frac{1}{2}$ of 16 cents?

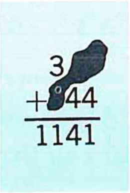
11. Peter had \$2. He earned \$.50 and spent \$.25. How much did he have then?

12. Hazel bought 3 cans of peaches for her mother at 50¢ a can. How much did the peaches cost?

13. Frank had 30¢. How many 8¢ pads of paper can he buy and how much money will he have left?

14. Which is the better buy, 3 bars of soap for 29¢ or 3 bars at 10¢ each?

Can you do this? Bobby had just finished his arithmetic homework, using his father's fountain pen. When he was playing with the pen, some ink squirted out and covered part of his work. When he wanted to copy his spoiled work neatly, he could not read the covered numerals. Can you help him find the missing numerals?



Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. The first step in solving a problem is to read it carefully to find how the question is related to the statement. (135)

2. Each problem should be expressed as an equation. (136, 137)

3. The signs $ and . are needed only in the final answer and are not to be used in writing equations. (135, 137, 138)

Words to Know

Estimate (145)

Questions to Discuss

1. What do you need to know about a problem before you can solve it? (133, 135, 136)

2. How can you tell when a problem must be solved by using more than one operation? (137, 138, 139, 140)

3. How would you estimate the product of 58 multiplied by 4? The difference between 119 and 225? (145, 146)

4. Why should you form the habit of estimating an answer for each problem? (146)

5. How can you decide whether to add, subtract, multiply, or divide before you make an estimate? (147)

Written Practice

Write the equation for each problem below. Solve each equation.

1. Terry earned $.60 raking leaves on Thursday, $.95 on Friday, and $1.00 on Saturday. He had $1.09 in his bank. He needed $4.20 to buy a ship's model. How much more must he have? (137)

2. Roy and Bob saved money to buy a tent. Their father told them that he would give them as much money as they had saved together. Roy had saved $3.78, and Bob had saved $4.11. How much money did they have altogether after their father had given them the money he had promised? (138)

3. Mr. Jackson bought enough 4¢ stamps to mail 117 business letters. How much change would he get from $5? (139)

4. Molly bought 3 handkerchiefs at 50¢ each and a scarf for 95¢. How much money did she spend altogether? (140)

Self-Evaluation

Part 1 Copy. Write each quotient, sum, difference, or product.

	a	*b*	*c*	*d*
1.	3)90	4)81	6)72	7)85
2.	5365 7493 6580 +9272	4396 2754 3869 +5678	3571 1233 4569 +9847	6147 4762 8515 +2384
3.	9154 −4387	8758 −5268	6004 −3871	5315 −2654
4.	4301 −2980	5275 −4389	6432 −5148	9105 −5267
5.	235 ×7	986 ×5	327 ×4	654 ×8

Part 2 Solve these problems.

1. Mr. Becker drove 987 miles in December, 1158 miles in January, and 1420 miles in February. How much farther did he drive in February than in December?

2. John began reading a 320-page book on Saturday. He read 108 pages that day and he read 36 pages on Sunday. How many more pages did he still have to read?

3. Mary bought 4 records at 49¢ each and a book for $1.98. How much money did she spend for the records and the book?

4. Robert had $5 to spend. He spent $1.29 for a ball and $3.49 for a glove. How much money did he have left?

5. Sally wants a new bicycle that costs $35.50. She saved $15.75, and her uncle gave her $5. How much more money does Sally need?

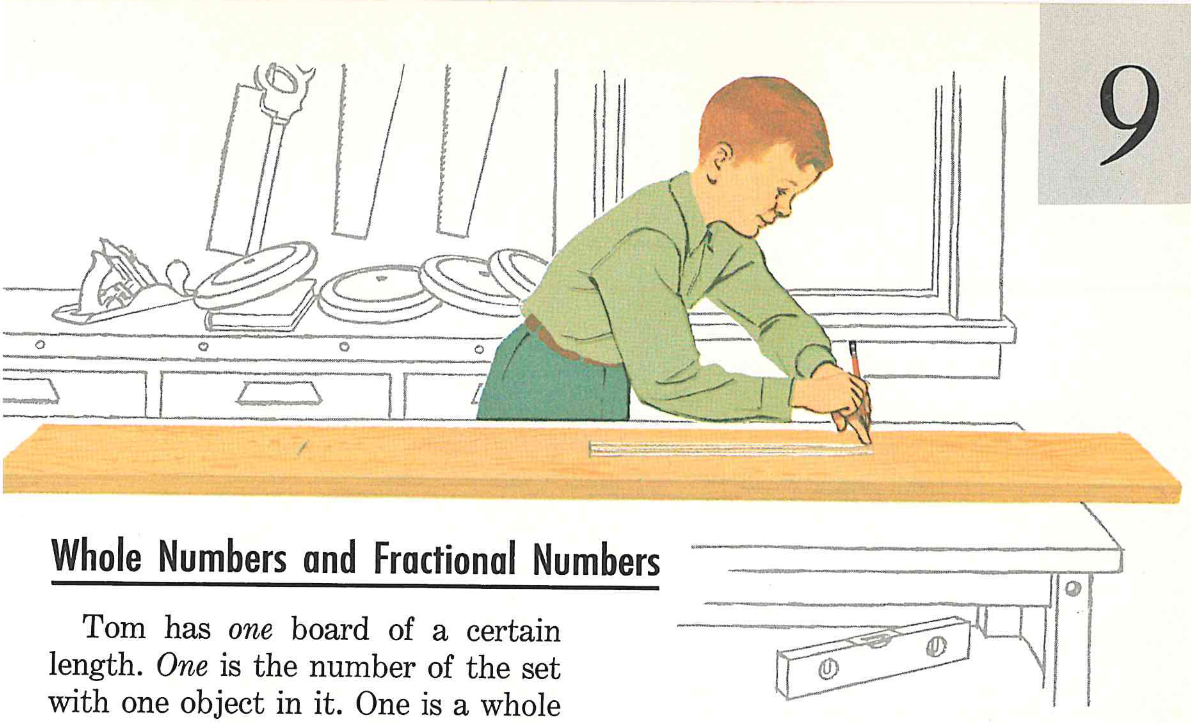
6. How many teams of 5 players each can be made from a class of 30 pupils?

Part 3 Copy each completed addition, subtraction, multiplication, and division below. In place of the ( ) beside each numeral, write the correct name for the number. Choose the names from the following list.

Difference
Product
Quotient
Multiplier
Sum
Subtrahend
Multiplicand
Divisor
Dividend
Minuend
Remainder
Addend

	a	*b*
1.	32 ( ) +48 ( ) 80 ( )	80 ( ) −48 ( ) 32 ( )
2.	32 ( ) ( ) 3)97 ( ) 9 7 6 1 ( )	32 ( ) ×3 ( ) 6 90 96 ( )

9



Whole Numbers and Fractional Numbers

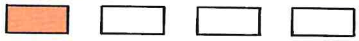
Tom has *one* board of a certain length. *One* is the number of the set with one object in it. One is a whole number. What are some other whole numbers?

Tom plans to cut the board into 4 parts of equal length. After Tom cuts the board, he can count the parts. He can give the number name *one fourth* to each of the four parts he has cut. One fourth is called a **fractional number.** The numeral $\frac{1}{4}$ is the number name for one of the fourths. What numeral is the number name for two of the fourths? For three of the fourths? For four of the fourths?

Such numerals as $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, and $\frac{4}{4}$ are called **fractions.** Each fraction has three parts: its two numerals, one above the other, and a short line, called a **fraction line,** which separates the two numerals.

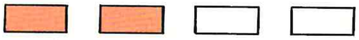
$\frac{1}{4}$ is the numeral for 1 of 4 parts of equal size.

$\frac{1}{4}$



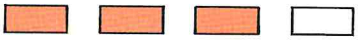
$\frac{2}{4}$ is the numeral for 2 of 4 parts of equal size.

$\frac{2}{4}$



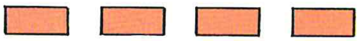
$\frac{3}{4}$ is the numeral for 3 of 4 parts of equal size.

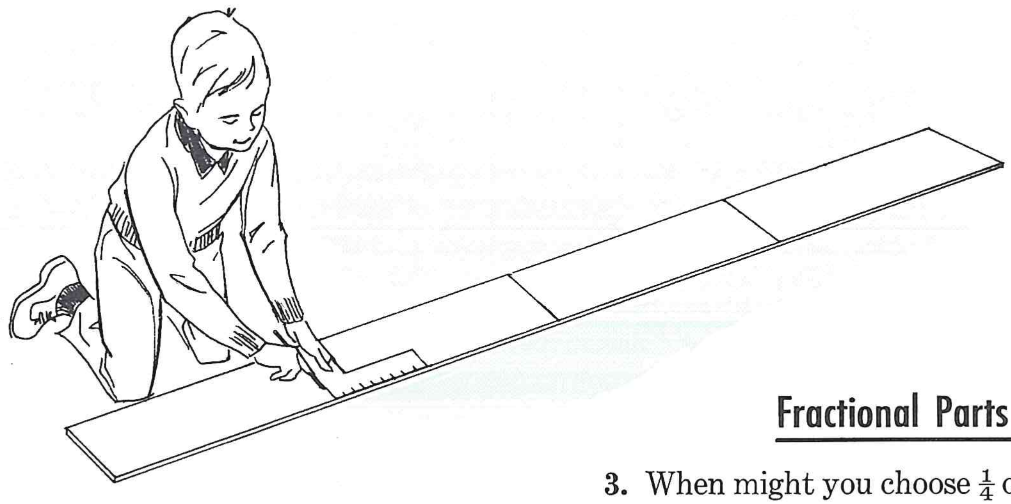
$\frac{3}{4}$



$\frac{4}{4}$ is the numeral for 4 of 4 parts of equal size.

$\frac{4}{4}$





Fractional Parts of 1

Howard has 1 board. After he cuts it along the lines he has drawn, he will have 4 pieces. The pieces will all be the same length.

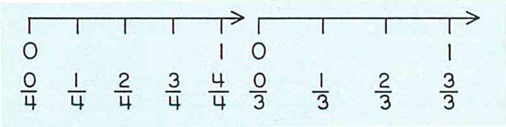
Whenever 1 of anything is divided into parts having the same size, each part is called a **fractional part.**

You use fractions to name fractional parts. Each fractional part of the board is $\frac{1}{4}$ of the whole board.

Oral Answer each question below.

1. How does the size of the whole quantity affect the size of its fractional parts?

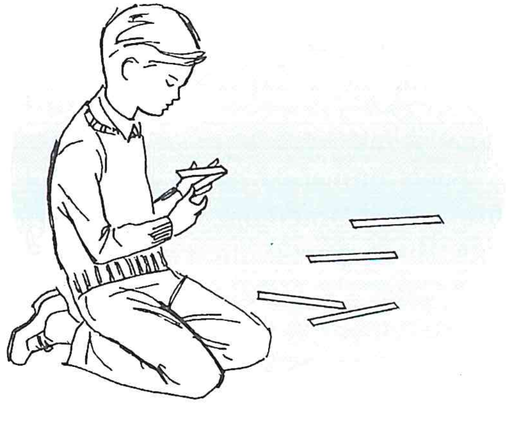
2. How many fractional parts do you see on each line?

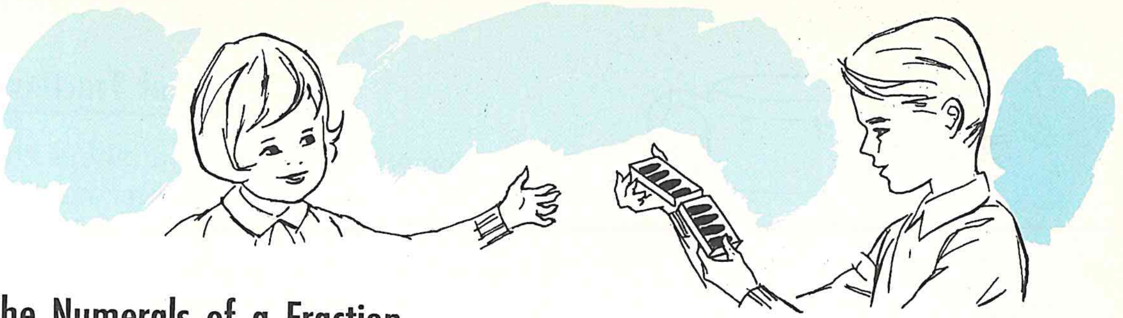

0
1
0
1
$\frac{0}{4}$ $\frac{1}{4}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$
$\frac{0}{3}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{3}{3}$

3. When might you choose $\frac{1}{4}$ of one candy bar rather than $\frac{1}{4}$ of a different candy bar?

4. How does the number of fractional parts affect the size of each fractional part?

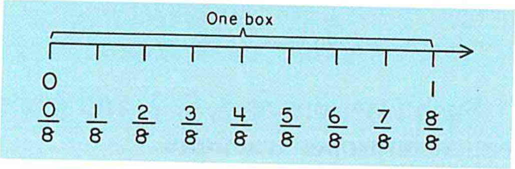
Something to do Cut three strips of paper 1 inch wide and 8 inches long. Fold the strips into fractional parts. Fold one strip into 2 fractional parts, one strip into 4 fractional parts, and one strip into 8 fractional parts. Give each fractional part its fraction name.





The Numerals of a Fraction

There are eight pieces of candy in the box. All are the same size. Each piece is $\frac{1}{8}$ of all the candy, as shown in the diagram below.



2 pieces of candy are how many eighths? How many eighths are 3 pieces? 4 pieces? 5 pieces? 6 pieces? 7 pieces? All 8 pieces?

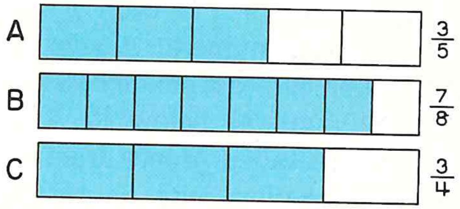
Suppose the boy ate 5 of the pieces of candy. You might say that he ate $\frac{5}{8}$ of the candy. The 8 in $\frac{5}{8}$ tells how many pieces there were altogether. What does the 5 tell?

Oral Answer these questions.

1. What fraction would you use in naming (a) 1 of 6 fractional parts? (b) 2 of 7 fractional parts? (c) 7 of 10 fractional parts?

2. What numerals would you use in writing a fraction that names (a) 1 of 2 fractional parts, (b) 3 of 5 fractional parts, (c) 9 of 10 fractional parts?

3. What does each numeral in the fraction below tell you about each drawing?

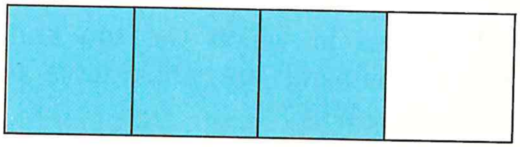


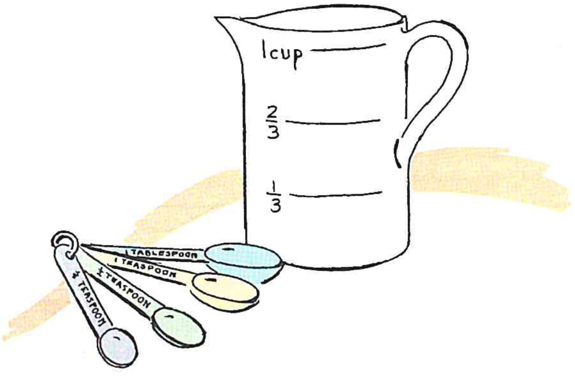
Written Write your answers to questions 1, 2, and 3 above.

Something to do Use squared paper. Cut 5 strips each 1 square wide. The numerals in the fractions below tell how many squares long to make each strip and how many squares of each strip you should shade.

a	*b*	*c*	*d*	*e*
$\frac{3}{4}$	$\frac{5}{6}$	$\frac{3}{8}$	$\frac{4}{5}$	$\frac{2}{3}$

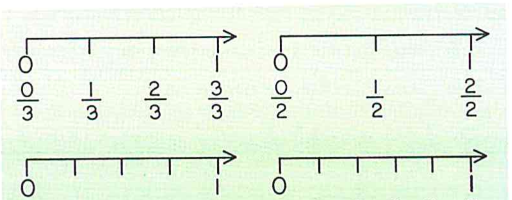
The first one is done for you.





Look at the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$. Which numeral, the one above or the one below the line, names the smaller number? In each of these fractions, the numeral above the fraction line names a smaller number than the numeral below it. These fractions are called **proper fractions.** A proper fraction may be thought of as naming parts of a whole.

Look at the fractions on the lines below. What do you notice about the two numerals of the last fraction on each line?



MORE PRACTICE
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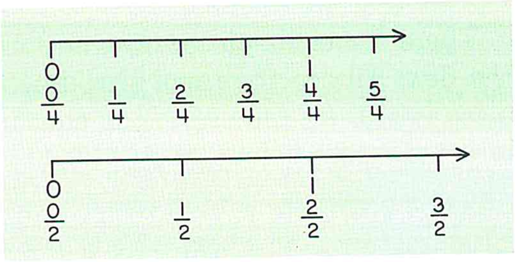
Fractions in which the top and bottom numeral are alike have a value of 1. Why?

Kinds of Fractions

Sometimes the numeral above the fraction line names a larger number than the numeral below it. This happens when you go beyond 1 on the number line, as shown below.



Such fractions as $\frac{5}{5}$, $\frac{3}{3}$, $\frac{5}{4}$, and $\frac{3}{2}$ are called **improper fractions.**

Oral Read each fraction below. Tell whether it is a proper fraction or an improper fraction. Also, tell which improper fractions have a value of 1.

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
$\frac{1}{3}$	$\frac{3}{5}$	$\frac{5}{3}$	$\frac{4}{4}$	$\frac{0}{2}$	$\frac{0}{4}$	$\frac{4}{2}$	$\frac{5}{5}$

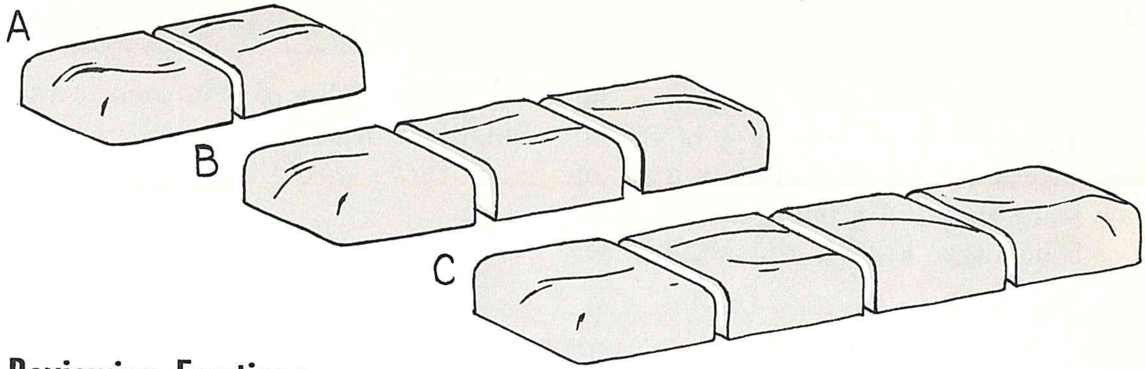
Written Follow these directions.

1. Write 7 proper fractions using 8 underneath the fraction line.

2. Write 5 fractions each having a value of 1.

3. Use these pairs of numerals to write improper fractions: 2 and 1, 3 and 2, 5 and 3.

4. Write as fractions: two thirds, five tenths, seven fourths.



Reviewing Fractions

Look at the picture above. It shows a 2-ounce candy bar divided into 2 parts of equal size, a 3-ounce bar divided into 3 parts of equal size, and a 4-ounce bar divided into 4 parts of equal size.

Oral Answer these questions.

1. Which candy bar, A, B, or C, is divided into halves? Into thirds? Into fourths?

2. Would the fractional parts, or parts of equal size, have been larger or smaller, if candy bar A had been cut into 4 parts, rather than into 2 parts?

3. Would the fractional parts have been larger or smaller if candy bar B had been cut into 2 parts of equal size?

4. What would have happened to the size of the fractional parts if candy bar C had been cut into 8 rather than into 4 parts of equal size?

5. Which is more: $\frac{1}{4}$ or $\frac{1}{3}$ of a cup of milk? $\frac{1}{5}$ of a small pie or $\frac{1}{5}$ of a larger pie? $\frac{1}{2}$ of a large apple or $\frac{1}{2}$ of a small apple?

Written Write the fraction to use for each of the following:

1. One half

2. One third

3. Two thirds

4. One fourth

5. Three fifths

6. Five sixths

7. One eighth

8. Three eighths

9. Nine tenths

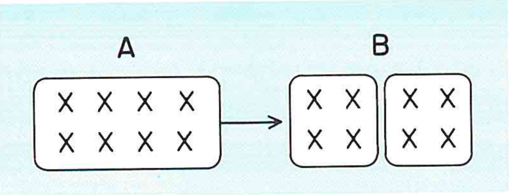
Write the number name for each of these fractions.

	a	*b*	*c*	*d*	*e*	*f*
10.	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{4}{5}$

Finding One Half of a Number

Suppose you want to answer the question: How much is $\frac{1}{2}$ of 8? To answer it, you can separate a set of 8 objects into 2 groups, or subsets, of equal size, leaving the original set empty.

See the diagram below.



Picture A above shows how many in the original set. In B, the X's have been separated into 2 groups, or subsets, of equal size. Is $\frac{1}{2}$ of 8 equal to 4?

What picture would you draw to show that $\frac{1}{2}$ of 10 is equal to 5?

You can save time in finding $\frac{1}{2}$ of a number by simply dividing it by 2. You know that $4 \div 2 = 2$. Then $\frac{1}{2}$ of 4 is equal to 2. You know that $12 \div 2 = 6$. Then $\frac{1}{2}$ of 12 is equal to 6.

How can you use division to find $\frac{1}{2}$ of 14? $\frac{1}{2}$ of 16? $\frac{1}{2}$ of 18? Can you use division to find $\frac{1}{2}$ of any even number?

Oral Tell how to find $\frac{1}{2}$ of each of the following numbers: 6, 20, 10, 24. What equation would you use in each case?

Tell the value of n in each of the equations below.

	a	*b*
1.	$18 \div 2 = n$	$24 \div n = 2$
2.	$22 \div 2 = n$	$20 \div n = 2$
3.	$36 \div 2 = n$	$10 \div n = 2$
4.	$40 \div 2 = n$	$6 \div n = 2$
5.	$48 \div 2 = n$	$66 \div n = 2$
6.	$74 \div 2 = n$	$80 \div n = 2$
7.	$98 \div 2 = n$	$52 \div n = 2$

Written Write the equation for each of the following problems. Solve each equation. Write the answer to each problem.

1. Betty's mother bought 36 eggs. She used $\frac{1}{2}$ of the eggs in 2 days. How many eggs did she use?

2. Sally bought $\frac{1}{2}$ pound of candy. A pound weighs 16 ounces. How many ounces of candy did she buy?

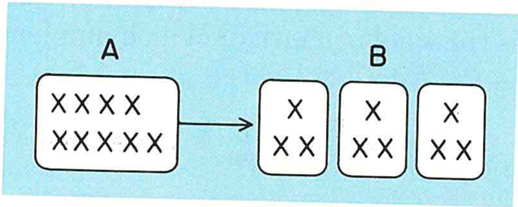
3. Robert walked $\frac{1}{2}$ mile in 15 minutes. He wondered how many feet he had walked. See if you can tell. (Reminder: 1 mile = 5280 feet.)

4. Jane cut a yard of material into halves. What was the length in inches of each half?

Finding One Third and One Fourth of a Number

Suppose you want to answer the question: How much is $\frac{1}{3}$ of 9? To answer it, you can separate a set of 9 objects into 3 subsets, leaving the original set empty.

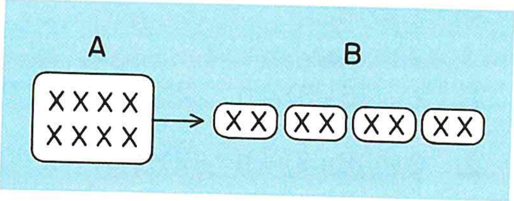
See the diagram below.



Picture A above shows how many in the original set. In B, the X's have been separated into 3 groups, or subsets of equal size. Is $\frac{1}{3}$ of 9 equal to 3?

On your own paper, draw diagrams to show: (a) $\frac{1}{3}$ of 6, (b) $\frac{1}{3}$ of 12, and (c) $\frac{1}{3}$ of 15.

Now study the diagram below. It shows how to find $\frac{1}{4}$ of 8.



Is $\frac{1}{4}$ of 8 equal to 2?

To find $\frac{1}{3}$ of a number, divide the number by 3. Because $9 \div 3 = 3$, $\frac{1}{3}$ of 9 is 3. Because $12 \div 3 = 4$, $\frac{1}{3}$ of 12 is 4. To find $\frac{1}{4}$ of a number, divide it by 4. Why?

Oral Answer these questions.

1. What question is asked by the statement $\frac{1}{3}$ of 9? $\frac{1}{3}$ of 12?

2. What question is asked by the statement $\frac{1}{4}$ of 8? $\frac{1}{4}$ of 12?

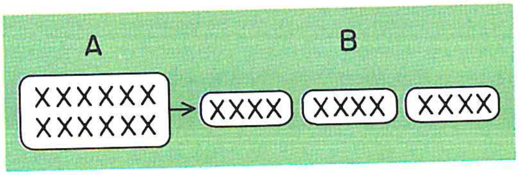
3. What are some other numbers, less than 25, which you can separate into thirds? Into fourths?

Written Copy. Write the answers.

	a	*b*
1.	$\frac{1}{4}$ of 28	$28 \div 4 = n$
2.	$\frac{1}{3}$ of 24	$24 \div 3 = n$
3.	$\frac{1}{4}$ of 32	$32 \div 4 = n$
4.	$\frac{1}{3}$ of 27	$27 \div 3 = n$
5.	$\frac{1}{4}$ of 20	$20 \div 4 = n$
6.	$\frac{1}{4}$ of 16	$16 \div 4 = n$
7.	$\frac{1}{3}$ of 21	$21 \div 3 = n$
8.	$\frac{1}{3}$ of 18	$18 \div 3 = n$
9.	$\frac{1}{2}$ of 16	$16 \div 2 = n$
10.	$\frac{1}{2}$ of 30	$30 \div 2 = n$
11.	$\frac{1}{3}$ of 36	$36 \div 3 = n$
12.	$\frac{1}{4}$ of 24	$24 \div 4 = n$

Beverly had 12 pieces of candy in a bag. She divided the candy into thirds and gave $\frac{2}{3}$ of the candy to her friends. How many pieces of candy did she give away?

The picture below may help you *see* what Beverly did.



Is $\frac{1}{3}$ of 12 equal to 4? Is $\frac{2}{3}$ of 12 equal to 8?

You can find the value of $\frac{2}{3}$ of 12 by first finding the value of $\frac{1}{3}$ of 12. Then multiply that value by 2. $\frac{2}{3}$ of 12 is equal to $2\times(\frac{1}{3}$ of $12)$.

$\frac{1}{3}$ of 12 means the same as $12\div3$. Then $\frac{2}{3}$ of 12 is equal to $2\times(12\div3)$. Does $2\times(12\div3)=8$?

Beverly gave away 8 pieces of candy.

Finding Two Thirds of a Number

To find $\frac{2}{3}$ of a number, divide the number by 3. Multiply the quotient by 2.

Oral Answer these questions.

1. In $\frac{2}{3}$ of $6=4$, which number is a fractional number? Which number is the whole quantity? Which number is the fractional part?

2. Which is more, $\frac{1}{2}$ of 12 or $\frac{2}{3}$ of 12? $\frac{2}{3}$ of 6 or $\frac{1}{2}$ of 6?

Written Copy. Write the answers.

	a	*b*
1.	$\frac{2}{3}$ of 15	$\frac{2}{3}$ of 24
2.	$\frac{1}{3}$ of 48	$\frac{1}{2}$ of 18
3.	$\frac{2}{3}$ of 63	$\frac{2}{3}$ of 21
4.	$\frac{1}{2}$ of 96	$\frac{1}{4}$ of 48
5.	$\frac{1}{4}$ of 28	$\frac{2}{3}$ of 27

A quick review

	a	*b*
1.	$2\times(15\div3)=n$	$2\times(30\div3)=n$
2.	$2\times(18\div3)=n$	$2\times(45\div3)=n$
3.	$2\times(48\div3)=n$	$2\times(60\div3)=n$

Something to do Draw pictures to show how to find $\frac{2}{3}$ of 6, $\frac{2}{3}$ of 9, and $\frac{2}{3}$ of 15.

Finding Three Fourths of a Number

Mary had 12 pieces of chocolate. She wanted to share her candy with 3 friends. She separated the candy into fourths and gave $\frac{1}{4}$ of it to each of her 3 friends. How many pieces of candy did she give away?

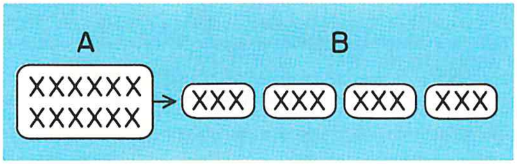
To solve the problem, you are to find the value of $\frac{3}{4}$ of 12. Why?

Think of $\frac{3}{4}$ of 12 as asking these two questions.

a. How many objects should be contained in each of 4 subsets, each having the same number of objects, if the original set is to be left empty?

b. How many objects will be in 3 of the subsets?

The picture below will help you *see* the solution.



How many objects are in each $\frac{1}{4}$ of 12? $3\times\frac{1}{4}$ of 12 is how many? Is $\frac{3}{4}$ of 12 equal to 9? Does $3\times(12\div4)=9$?

To find $\frac{3}{4}$ of a number, you divide the number by 4. Then you multiply the quotient by 3.

To write $\frac{3}{4}$ of 12 in equation form, you need a sign to replace *of*. That sign is ×. Thus $\frac{3}{4}$ of 12 may be written $\frac{3}{4}\times12$.

$\frac{1}{2}$ of 12 is written $\frac{1}{2}\times12=n$. $\frac{2}{3}$ of 12 is written $\frac{2}{3}\times12=n$.

Oral Tell how you would write each of the following as an equation, using n for the answer. Then tell the value of n.

	a	*b*
1.	$\frac{3}{4}$ of 8	$\frac{3}{4}$ of 16
2.	$\frac{3}{4}$ of 20	$\frac{3}{4}$ of 24
3.	$\frac{3}{4}$ of 32	$\frac{3}{4}$ of 36

Written Solve each problem below.

1. In a class of 27 children, $\frac{2}{3}$ had been with the class for at least 3 years. How many children had been with the class for 3 years or more?

2. Jerry had 36 sea shells in a collection. $\frac{3}{4}$ of them had come from Oregon. How many of the shells had come from that state?

3. Sally had 48 pages in her stamp book. She had enough stamps to fill $\frac{1}{4}$ of the pages. How many pages could she fill?

4. Ronald had 36 tickets to sell. He was able to sell $\frac{2}{3}$ of them. How many of the tickets was he able to sell?

MORE PRACTICE PAGE 308

Writing Remainders as Fractions

Suppose you are to divide 7 yards of ribbon into 3 pieces of equal length and want to know the length of each piece. You can find the length by dividing 7 by 3, as shown. Each piece will be at least 2 yards long. The one yard remaining must also be divided by 3. When you divide 1 by 3 you get the quotient $\frac{1}{3}$. Each piece of ribbon will be 2 yards$+\frac{1}{3}$ yard or $2+\frac{1}{3}$ yards long. To save time in writing $2+\frac{1}{3}$, the plus sign is usually left out. Then $2+\frac{1}{3}$ is written like this: $2\frac{1}{3}$. A numeral such as $2\frac{1}{3}$ is called a **mixed fraction** since both a whole number and a fractional number are named.

$$\begin{array}{r} 2\text{ r}1 \\ 3\overline{)7} \\ 6 \\ \hline 1 \end{array}$$

You can see why such numerals as $2\frac{1}{3}$ are called mixed fractions. On a number line on which thirds are shown, 2 may appear either as 2 or as $\frac{6}{3}$. Is $\frac{6}{3}$ a fraction? Do you see why $2\frac{1}{3}$ is called a mixed fraction?

Study the division at the right. It shows how you are to write the quotient as a mixed fraction.

$$\begin{array}{r} 2\frac{1}{3} \\ 3\overline{)7} \\ 6 \\ \hline 1 \end{array}$$

Sometimes you have to decide whether or not you should express an answer as a mixed fraction. If you think carefully about the problem you are solving, you will have little trouble in deciding what to do. Suppose you were to divide a group of 22 pupils into teams of 5 pupils each. You would have 4 teams. Could you possibly have $\frac{2}{5}$ of a pupil to add to each team? Could your answer be $4\frac{2}{5}$ pupils? Why is it possible to have such answers as $4\frac{1}{4}$ gallons, $3\frac{9}{10}$ miles, and $5\frac{1}{2}$ yards?

Suppose you are to solve the equation $9 \div 2 = n$ to find the value of n. You will use the following steps in solving the equation.

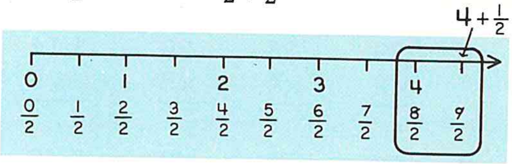
Step 1: Think: 9 is greater than 2, but it is not an even number; so n will be a mixed fraction.

Step 2: To find the whole number named in a mixed fraction, think of the even number that is less than but nearest to 9. That number is 8.

Step 3: You can now write:

$$n=\frac{9}{2}=\frac{8+1}{2}=\frac{8}{2}+\frac{1}{2}=4+\frac{1}{2} \text{ or } 4\frac{1}{2}$$

The number line may help you see how $\frac{9}{2}$ becomes $\frac{8}{2}+\frac{1}{2}$.



$\frac{8}{2}$ corresponds to 4.

$\frac{9}{2}$ is $\frac{1}{2}$ more than $\frac{8}{2}$.

$\frac{9}{2}$ is $4+\frac{1}{2}$ or $4\frac{1}{2}$.

As you can see, when you know how to use fractional numbers, you can write a quotient and remainder as a single number.

Oral Tell the steps used in solving each equation below.

1. $\frac{11}{2}=\frac{10+1}{2}=\frac{10}{2}+\frac{1}{2}=5+\frac{1}{2}=5\frac{1}{2}$
2. $\frac{14}{3}=\frac{12+2}{3}=\frac{12}{3}+\frac{2}{3}=4+\frac{2}{3}=4\frac{2}{3}$

Written Solve each equation below. Write the remainders as fractions.

	a	*b*
1.	$37 \div 3 = n$	$58 \div 5 = n$
2.	$75 \div 2 = n$	$89 \div 4 = n$
3.	$97 \div 6 = n$	$43 \div 4 = n$
4.	$95 \div 7 = n$	$63 \div 5 = n$
5.	$59 \div 2 = n$	$49 \div 4 = n$

Solve these problems.

6. Mary has a piece of string 10 feet long. She wants to cut it into 3 pieces of the same length. How long will each of the 3 pieces of string have to be?

7. John has a board 7 feet long. He wants to use it for the sides of a square box. After he has cut his board into 4 pieces of equal length, how long is each piece?

8. Elizabeth had to read a story which is 20 pages long. She finished the story in 9 minutes, reading the same number of pages in each minute. How many pages did Elizabeth read in 1 minute?

9. Ellen has 36 cents. She decided to put $\frac{1}{4}$ of the money in her bank. How many cents should she put in her bank?

10. There will be 3 buses to take 105 children on a trip. If the same number of children ride in each bus, how many children should there be in each bus?

11. At $4.98 a gallon, how much will 4 gallons of paint cost?

12. Alan gets $1.00 allowance each week, and earns $.75. If he saves all of his money for 4 weeks, how much money will he have at the end of that time?

MORE PRACTICE PAGE 308

Practicing Addition, Subtraction, Multiplication, and Division

Part 1 Copy. Find each sum. Check.

	a	*b*	*c*	*d*
1.	291 78 +442	89 588 +7	90 127 +314	$2.02 7.60 +.88
2.	789 590 +134	318 400 +237	347 909 +117	$1.00 7.62 +1.03
3.	2038 7015 216 +3000	110 2976 1032 +1207	1118 307 2645 +18	$18.00 8.37 12.35 +54.20
4.	4023 2940 2310 +1652	2604 3129 1500 +3107	3224 5706 3415 +1003	$77.00 11.17 30.03 +17.90

Part 2 Copy. Find each difference. Check by adding.

	a	*b*	*c*	*d*
1.	46 −9	94 −5	51 −16	$.82 −.25
2.	982 −37	170 −89	481 −38	$5.73 −.99
3.	813 −224	621 −333	408 −199	$3.00 −1.24
4.	9233 −275	2687 −953	7482 −534	$15.92 −2.43
5.	5187 −1409	3892 −1955	4963 −2458	$99.00 −19.52

Part 3 Copy. Find each product. Check by multiplying again.

	a	*b*	*c*	*d*
1.	39 ×2	26 ×4	29 ×3	$.14 ×5
2.	66 ×3	75 ×2	49 ×6	$.45 ×8
3.	321 ×3	422 ×2	201 ×4	$4.01 ×8

Part 4 Copy. Find each quotient. Check by multiplying.

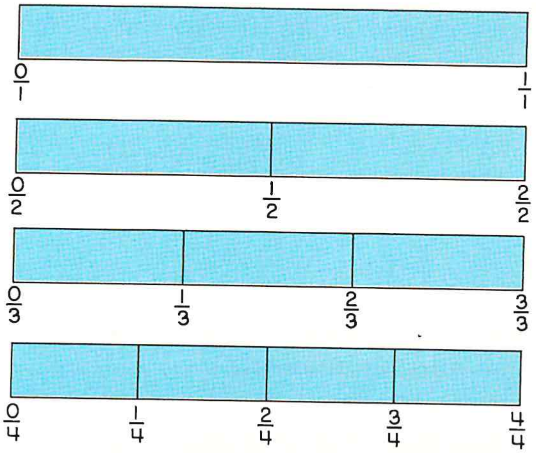
	a	*b*	*c*	*d*
1.	$2\overline{)52}$	$3\overline{)72}$	$5\overline{)60}$	$4\overline{)60}$
2.	$8\overline{)88}$	$7\overline{)84}$	$4\overline{)52}$	$3\overline{)39}$
3.	$2\overline{)27}$	$4\overline{)74}$	$5\overline{)93}$	$6\overline{)79}$
4.	$7\overline{)91}$	$3\overline{)88}$	$4\overline{)42}$	$8\overline{)95}$

Part 5 Write each division using the sign $\overline{)\quad}$, and write each multiplication in column form. Solve.

	a	*b*
1.	72÷6=n	5×86=n
2.	96÷9=n	3×98=n
3.	49÷7=n	8×163=n
4.	55÷4=n	5×247=n

Changing the Form of Ones and of Halves

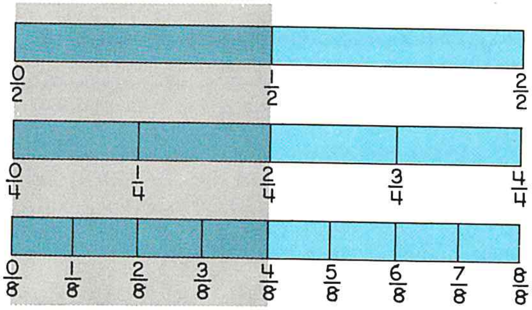
Think of each strip below as representing the number one.



Do you see that $\frac{1}{1}$ has a value of 1? Does $\frac{2}{2}$ have a value of 1? How about $\frac{3}{3}$? $\frac{4}{4}$?

$\frac{2}{2}$, $\frac{3}{3}$, and $\frac{4}{4}$ are all numbers that differ in form from 1 but have the same value as 1.

Now look at the shaded parts of the pieces of paper below. Are they all the same length?



Are $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ equal in value?

Oral Answer these questions.

1. $\frac{1}{2}$ and $\frac{2}{4}$ have the same value. In what way is $\frac{1}{2}$ of an apple different from $\frac{2}{4}$ of an apple?

2. Does $\frac{2}{4}$ differ in value from $\frac{3}{6}$?

Read each row of numbers below. Then answer questions 3 through 5.

a. $\frac{1}{1}=\frac{2}{2}=\frac{3}{3}=\frac{4}{4}=\frac{5}{5}$

b. $\frac{1}{2}=\frac{2}{4}=\frac{3}{6}=\frac{4}{8}=\frac{5}{10}$

3. How would you extend row *a* above to $\frac{10}{10}$?

4. How would you extend row *b* above to $\frac{10}{20}$?

5. What are some other fractions that are equal in value to $\frac{1}{2}$?

Written Copy. Replace each n with the missing numeral.

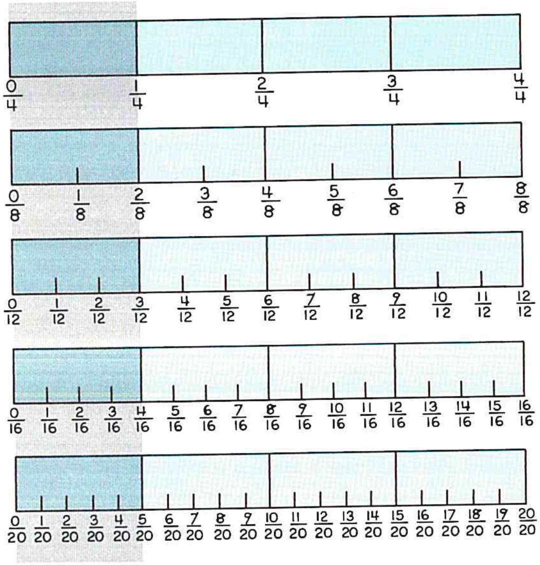
	a	*b*	*c*
1.	$1=\frac{n}{2}$	$1=\frac{n}{4}$	$1=\frac{n}{6}$
2.	$\frac{1}{2}=\frac{n}{4}$	$\frac{1}{2}=\frac{n}{8}$	$\frac{1}{2}=\frac{n}{6}$
3.	$\frac{1}{2}=\frac{3}{n}$	$\frac{1}{2}=\frac{5}{n}$	$\frac{1}{2}=\frac{4}{n}$

A quick review

	a	*b*
1.	$(496-397)+1=n$	$17+(49\div7)=n$
2.	$117-(50-3)=n$	$9\times(96\div8)=n$

Changing the Form of Fourths

The pieces of paper below have been divided into fractional parts. What do you notice about the length of the shaded fractional part on each piece of paper?



Are there twice as many parts of equal size in $\frac{2}{8}$ as in $\frac{1}{4}$?

Are there three times as many parts of equal size in $\frac{3}{12}$ as in $\frac{1}{4}$?

How many times as many parts of equal size are in $\frac{4}{16}$ as in $\frac{1}{4}$?

Look again at the size of the fractional parts of the pieces of paper above.

Is $\frac{1}{4}$ the same length as $\frac{2}{8}$? Is $\frac{1}{4}$ also the same length as $\frac{3}{12}$? As $\frac{4}{16}$? As $\frac{5}{20}$?

Oral Answer each question below.

1. In what way is the fractional part named $\frac{1}{4}$ like the fractional part named $\frac{2}{8}$? In what way are $\frac{1}{4}$ and $\frac{2}{8}$ different?

2. Tell the missing numeral in each of these statements.

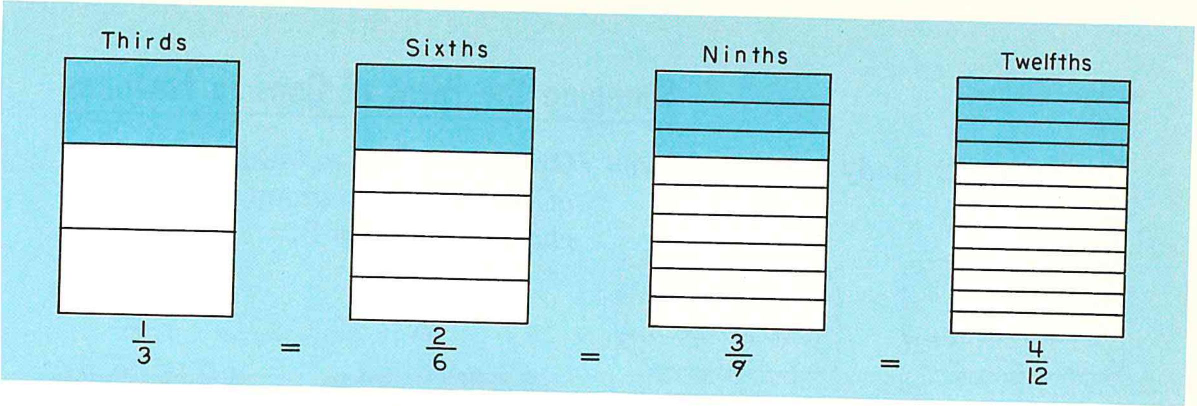
$\frac{1}{4}=\frac{2}{n}$ $\frac{1}{4}=\frac{n}{8}$ $\frac{2}{2}=n$

Written Copy. Replace each n with the missing numeral.

	a	*b*	*c*
1.	$\frac{1}{4}=\frac{n}{8}$	$\frac{1}{4}=\frac{n}{12}$	$\frac{1}{4}=\frac{n}{16}$
2.	$\frac{1}{4}=\frac{5}{n}$	$\frac{1}{4}=\frac{6}{n}$	$\frac{1}{4}=\frac{8}{n}$
3.	$\frac{1}{2}=\frac{n}{6}$	$\frac{2}{2}=n$	$\frac{4}{4}=n$
4.	$\frac{1}{2}=\frac{4}{n}$	$\frac{1}{2}=\frac{6}{n}$	$\frac{1}{4}=\frac{n}{8}$
5.	$\frac{1}{4}=\frac{n}{36}$	$\frac{1}{2}=\frac{n}{20}$	$\frac{1}{4}=\frac{5}{n}$
6.	$\frac{1}{2}=\frac{8}{n}$	$\frac{1}{4}=\frac{4}{n}$	$\frac{1}{4}=\frac{3}{n}$
7.	$\frac{2}{2}=\frac{n}{4}$	$\frac{1}{2}=\frac{n}{16}$	$\frac{1}{4}=\frac{9}{n}$
8.	$\frac{1}{4}=\frac{3}{n}$	$\frac{1}{4}=\frac{n}{24}$	$\frac{1}{2}=\frac{14}{n}$
9.	$\frac{n}{4}=\frac{4}{16}$	$\frac{n}{2}=\frac{2}{4}$	$\frac{1}{2}=\frac{10}{n}$

Can you do this? Decide upon the pattern for the row of fractions below. Make the row long enough so that the last fraction in it is $\frac{12}{48}$.

$$\frac{1}{4}=\frac{2}{8}=\frac{3}{12}=\frac{4}{16}=\frac{5}{20}$$

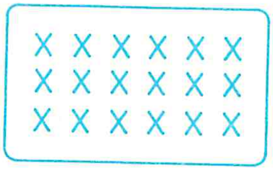


Changing the Form of Thirds

The rectangles above have been divided into fractional parts. Is the shaded part of each rectangle the same size?

How many fractional parts are in a rectangle that is divided into thirds? Into sixths? Into ninths? Into twelfths? Which fractional part of each rectangle above is larger: $\frac{1}{3}$ or $\frac{1}{6}$? $\frac{1}{3}$ or $\frac{1}{9}$? $\frac{1}{12}$ or $\frac{1}{6}$? Does $\frac{1}{3}=\frac{2}{6}$? Does $\frac{1}{3}=\frac{3}{9}$? Does $\frac{1}{3}=\frac{4}{12}$?

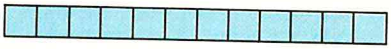
Oral Look at this set of 18 X's. Then answer the questions.



1. $\frac{1}{3}$ of 18 X's is how many X's?
2. $\frac{1}{6}$ of 18 X's is how many X's?
3. $\frac{2}{6}$ of 18 X's is how many X's?
4. $\frac{1}{9}$ of 18 X's is how many X's?
5. $\frac{3}{9}$ of 18 X's is how many X's?
6. Is $\frac{1}{3}$ of 18 X's equal to $\frac{2}{6}$ of 18 X's?
7. Is $\frac{1}{3}$ of 18 X's equal to $\frac{3}{9}$ of 18 X's?

Written Write your answers to questions 1 through 7 above.

Something to do Take a piece of squared paper, 12 squares long, like this:



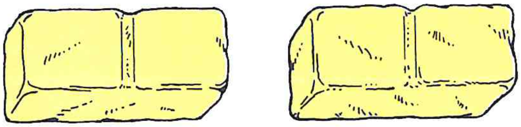
Use this piece of paper to help you decide which fraction of each of the following pairs is the name of the larger fractional part.

	a	*b*
1.	$\frac{1}{3}$ or $\frac{1}{4}$	$\frac{1}{3}$ or $\frac{1}{6}$
2.	$\frac{1}{6}$ or $\frac{1}{4}$	$\frac{1}{2}$ or $\frac{1}{4}$
3.	$\frac{1}{2}$ or $\frac{1}{3}$	$\frac{1}{12}$ or $\frac{1}{6}$

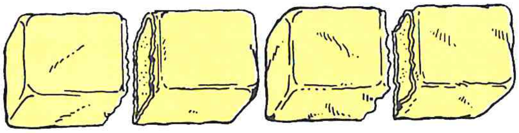
MORE PRACTICE PAGE 308

Changing the Form of Ones to Fractions

John had 2 candy bars as shown below.

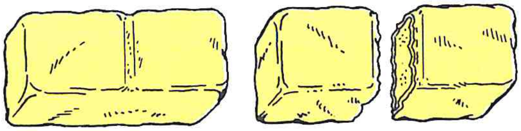


He can break the candy bars into halves, as shown.



How many halves are shown above? The numeral for *four halves* is the improper fraction $\frac{4}{2}$. What improper fraction would you use in place of the number words *three halves?*

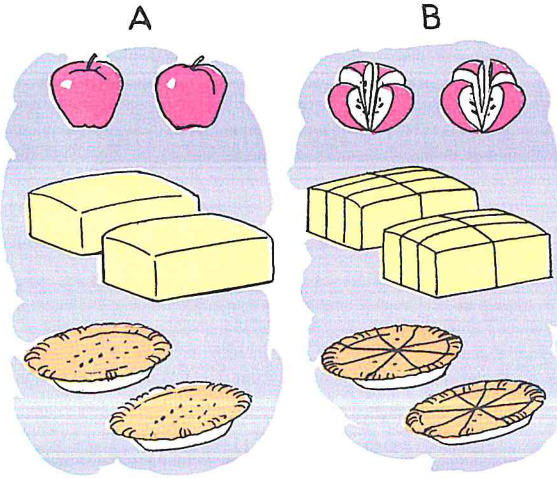
Suppose John had broken only one of the candy bars and had left the other one whole, as shown.



Then he would have 1 candy bar and $\frac{2}{2}$ candy bars, or $1+\frac{2}{2}$. This may be abbreviated to $1\frac{2}{2}$. It is read *one and two halves*. If John ate $\frac{1}{2}$ of a candy bar, he would have 1 whole candy bar and $\frac{1}{2}$ of a candy bar left.

$1+\frac{1}{2}$ is abbreviated to $1\frac{1}{2}$. How would you read $1\frac{1}{2}$, using words?

Oral Be ready to tell how the form of each object in group A below was changed in group B.



Answer the following questions.

4. Suppose you ate 1 apple and $\frac{1}{4}$ of another apple. What number words would you use to tell the number of apples you had eaten?

5. Suppose you had eaten one apple cut into fourths and 3 of the fourths of a second apple. What number words would you use to tell the number of apples you had eaten?

6. Is there as much cake in $\frac{12}{6}$ cakes as in 2 cakes?

7. Is there as much pie in $\frac{16}{8}$ pies as in 2 pies?

8. Which numerals would you use in place of these number words: one and three eighths, one and five sixths, one and four fifths?

9. How many whole cakes and how many pieces of cake are in $1\frac{5}{6}$ cakes? In $1\frac{1}{6}$ cakes?

Read:

	a	*b*	*c*	*d*
10.	$\frac{3}{4}$	$7\frac{1}{4}$	$\frac{6}{4}$	$1\frac{3}{4}$
11.	$\frac{1}{6}$	$1\frac{1}{6}$	$\frac{7}{6}$	$1\frac{5}{6}$
12.	$\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$
13.	$2\frac{1}{4}$	$5\frac{5}{6}$	$7\frac{3}{8}$	$2\frac{3}{4}$
14.	$1\frac{7}{8}$	$6\frac{3}{5}$	$\frac{5}{7}$	$\frac{2}{9}$

Written Use the pictures in A and B on page 166 to help you write the following as numerals.

1. Three fourths

2. One and one fourth

3. Five eighths

4. One and one eighth

5. One and five sixths

6. Nine eighths

7. Two and three fourths

8. Five and one fourth

9. Three and seven eighths

10. Four and five eighths

11. Nine and three fourths

Solve these problems.

12. Jean had \$2.70. She spent $\frac{1}{6}$ of it for a jigsaw puzzle. How much did the puzzle cost?

13. The Allens buy 8 quarts of milk a day. They use $\frac{1}{4}$ of it at breakfast. How many quarts of milk do they use at breakfast?

14. Mrs. Jones served $\frac{1}{2}$ a grapefruit to each of 6 people. How many grapefruit did she need?

15. Mrs. Baker picked some ears of sweet corn. She gave half of them to her neighbor. She kept 18 ears of corn for herself. How many ears of corn did she pick?

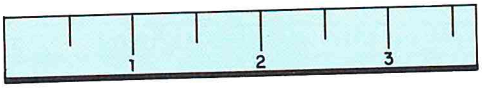
16. There were 4 large boxes of drawing paper in the school storeroom. Each box contained 144 sheets of paper. How many sheets were there altogether?

17. On the shelf Bill found 2 dozen small water-color brushes worth \$2.04 a dozen and a dozen larger brushes worth \$2.52 a dozen. How much were all the brushes worth?

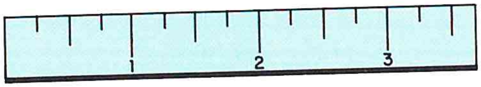
18. 7350 persons live in Oakdale and 5801 persons live in Berwyn. How many more persons live in Oakdale than in Berwyn?

Measuring Carefully

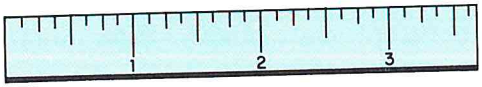
A



B

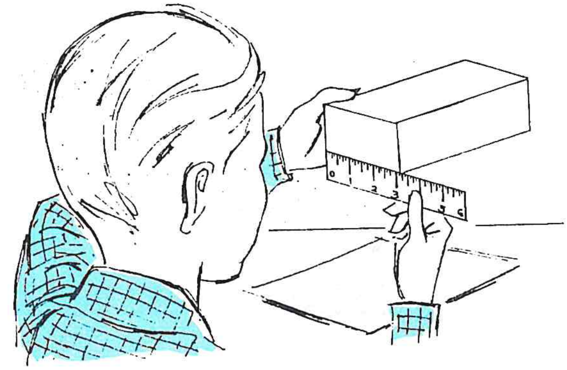


C



The pictures above show 3 ways in which an inch can be divided. Ruler A is divided into half inches. Ruler B is divided into fourth inches. Ruler C is divided into eighth inches.

You may need to use a ruler as Tom is doing. He wanted a stiff piece of paper to cover the bottom of a box. By measuring carefully, he decided that he needed a piece of paper $3\frac{1}{8}$ inches wide.



Look carefully at the ruler Tom is using. Each inch is divided into 8 parts of equal size. Each part is called $\frac{1}{8}$, or an eighth of an inch. Do you see that there are 8 eighths in each inch?

Oral Use the pictures in column one to help you answer these questions.

1. How many half inches are there in each inch?

2. How many eighth inches are there in each inch?

3. How many fourth inches are there in each half inch?

4. How many eighth inches are there in each quarter inch?

5. How many eighth inches are there in each half inch?

6. How many $\frac{1}{4}$ inches are needed to make a length of $\frac{3}{4}$ inch?

Using the pictures to help you, tell which fractional part is longer.

7. $\frac{1}{8}$ inch or $\frac{1}{4}$ inch

8. $\frac{3}{8}$ inch or $\frac{1}{2}$ inch

9. $\frac{5}{8}$ inch or $\frac{3}{4}$ inch

10. $\frac{7}{8}$ inch or $\frac{1}{2}$ inch

Read. Replace each n with a numeral. The pictures may help you.

	a	*b*	*c*
11.	$\frac{1}{2}=\frac{n}{4}$	$\frac{2}{8}=\frac{1}{n}$	$\frac{3}{4}=\frac{n}{8}$
12.	$\frac{2}{4}=\frac{n}{8}$	$\frac{1}{2}=\frac{n}{6}$	$\frac{4}{8}=\frac{1}{n}$

Written Write your answers to questions 1 through 12 above.

Finding Fractional Parts of Measures

How many quarts of milk are needed to fill $\frac{3}{4}$ of 8 quarts? To answer the question, you can change the problem to the question "$\frac{3}{4}$ of 8 are how much?" $\frac{1}{4}$ of 8 is $\frac{8}{4}$, or 2. $\frac{3}{4}$ is 3 times $\frac{1}{4}$. Then $\frac{3}{4}$ of 8 is 3 times 2, or 6. As an equation, $\frac{3}{4}$ of 8 becomes $3 \times (8 \div 4) = n$. The value of n is 6. 6 quarts of milk are needed to fill $\frac{3}{4}$ of 8 quarts.

Oral Read each of the problems below. Tell how you would change each one to an equation.

1. Ralph bought $\frac{1}{2}$ of a gallon of milk. How many quarts does this equal?

2. Judy and Mary played jump rope for $\frac{1}{4}$ of an hour. How many minutes did they play?

3. Shirley bought $\frac{1}{2}$ of a pound of butter. How many ounces of butter was that?

4. David's mother bought $\frac{1}{4}$ of a bushel of apples at the store. How many pecks of apples did she buy?

5. Ann measured a piece of material and found that it was $\frac{2}{3}$ of a yard long. What was the length of the material in inches?

Written Write an equation for each problem above. Solve the equation. Write your answer for each problem. Number your answers 1 through 5.

Copy. Write each answer. The sign = is used to mean *is equivalent to.*

	a	*b*
6.	$\frac{1}{4}$ lb. = ___ oz.	$\frac{3}{4}$ lb. = ___ oz.
7.	$\frac{1}{6}$ ft. = ___ in.	$\frac{5}{6}$ ft. = ___ in.
8.	$\frac{1}{4}$ yd. = ___ in.	$\frac{2}{3}$ yd. = ___ in.
9.	$\frac{1}{2}$ mi. = ___ ft.	$\frac{1}{4}$ mi. = ___ ft.
10.	$\frac{1}{4}$ hr. = ___ min.	$\frac{3}{4}$ hr. = ___ min.

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. Fractions are numerals. (151)

2. Fractions may be used to name the fractional parts of 1. (152)

3. Fractions may be used to name the fractional parts of a set. (153)

4. In each division the remainder may be expressed as a fraction. (160)

5. The form of a fraction can be changed without changing its value. (164, 165, 166)

Words to Know

1. Fractional number, fraction line, fractions (151)

2. Fractional part (152)

3. Proper fractions and improper fractions (154)

4. Mixed fraction (160)

Questions to Discuss

1. What numeral would you use to name 3 of the 4 equal parts of 1? Of 4? (151, 159)

2. How might you divide a ribbon into fractional parts? How would you decide upon the fraction to use in naming each part? (160)

3. What do the numerals 5 and 8 in $\frac{5}{8}$ tell you? (153)

4. How do a proper fraction and an improper fraction differ from each other? (154)

5. How do you find $\frac{2}{3}$ of 6? $\frac{3}{4}$ of 12? (158, 159)

6. When might you want to express a remainder as a fraction? (160)

7. How do you change the form of fourths to eighths? Of thirds to sixths? (164, 165)

8. How do you change the form of 1 to a fraction? (166)

Written Practice

Copy the statements below. Find each answer.

	a	*b*	
1.	$\frac{1}{2}$ of 6	$\frac{1}{2}$ of 4	(156)
2.	$\frac{1}{4}$ of 8	$\frac{1}{3}$ of 3	(157)
3.	$\frac{2}{3}$ of 6	$\frac{2}{3}$ of 9	(158)
4.	$\frac{3}{4}$ of 8	$\frac{1}{3}$ of 9	(159)
5.	$\frac{1}{4}=\frac{n}{8}$	$\frac{1}{2}=\frac{n}{16}$	(164)
6.	$1=\frac{n}{4}$	$2=\frac{n}{8}$	(166)
7.	$\frac{1}{3}$ hr. = ___min.	$\frac{1}{2}$ mi. = ___yd.	(169)

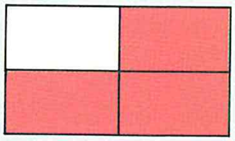
Self-Evaluation

Part 1 Copy. Write each quotient, sum, difference, or product.

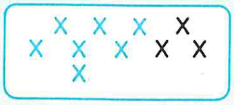
	a	*b*	*c*	*d*
1.	6)37	7)48	9)54	8)75
2.	5)76	4)69	8)56	6)86
3.	1353 9751 +2467	5621 5414 +5396	3474 9537 +2486	$24.56 91.53 +77.82
4.	6850 2452 1004 +3222	8040 8558 1113 +4755	1614 5945 1410 +7217	5020 9412 1540 +4519
5.	9786 −4397	5437 −4592	2915 −1876	8437 −6588
6.	7550 −1952	1863 −1776	2000 −1492	7610 −5988
7.	743 ×6	876 ×7	945 ×9	835 ×8
8.	678 ×6	591 ×8	718 ×7	934 ×4

Part 2 Write the answer to each question below.

1. What fractional part of the picture is shaded?



2. What fractional part of the X's are in black?



3. Which piece of string is shorter —a $\frac{1}{2}$-yard piece or a $\frac{1}{3}$-yard piece?

4. Which is more—$\frac{2}{3}$ dozen or $\frac{3}{4}$ dozen eggs?

5. Write the next 5 fractions that belong in each row.

a. $\frac{1}{3}=\frac{2}{6}=\frac{3}{9}=\frac{4}{12}=\frac{5}{15}$

b. $\frac{1}{4}=\frac{2}{8}=\frac{3}{12}=\frac{4}{16}=\frac{5}{20}$

Part 3 Write an equation for each problem below. Solve the equation. Write the correct answer.

1. Mary had a ribbon 38 inches long. She divided its length into thirds. What was the length in inches of each fractional part?

2. John had 24 rabbits to sell. His uncle said that he would take $\frac{3}{4}$ of them. How many rabbits can John sell to his uncle?

3. There were 33 children in a fourth grade. If $\frac{1}{3}$ were absent one day, how many were present?

4. A truck was loaded with $\frac{3}{4}$ ton of sugar. What was the weight of the sugar in pounds?

5. John needs 150 stamps to fill his stamp book. He has 98 stamps. How many more stamps does he need?

Midyear Review

On your own paper, write your answer to each question on these two pages. Then you will have answers to look at when the questions are discussed in class. The numerals in ( ) refer to pages where you can turn for help.

Number Meanings

1. Which whole number means none at all? (6)

2. What do the 1 and the 0 in 10 mean? (6)

3. How many digits are all that are needed in writing any numeral in the Hindu-Arabic system? (5)

4. Which is the largest number that you can show with two digits? With three digits? With four digits? (6, 7)

5. Which is the smallest number you can show with two digits? (6)

6. Which numeral means 8 tens and 0 ones? (7)

7. Which Roman numeral is used to show 1? 5? 10? (13)

Addition

1. Which of the following words and signs make you think of the operation of addition? (17)

a	*b*
+	addend
difference	sum
plus	minus

2. What happens to the sum of two numbers when you change the order of the addends? (18)

3. What is the sum when you add 0 to 2? When you add 2 to 0? (21)

4. In adding 8, 4, and 7, which two numbers should be added first? (21)

5. How do you check addition? (18)

Subtraction

1. Which of the following words and signs make you think of the operation of subtraction? (33)

a	*b*
sum	minuend
−	+
difference	subtrahend

2. What happens to a number when you add 5 to it and then subtract 5 from it? (33)

3. Which number is the difference when the minuend and the subtrahend are the same? When you subtract 0 from a number? (37, 44)

4. How can you check your work in subtraction? (34)

Multiplication

1. Which words and signs below make you think of multiplication? (57, 62)

a	*b*
product	−
×	multiplicand
multiplier	partial product

2. How might you use addition to find the value of n in $5\times3=n$? (58)

3. What is the result when you multiply a number by 1? When you multiply 1 by a number? (59)

4. What is the product of 0 and another number? (61)

5. How do you multiply a three-digit number by a one-digit number? (62, 69)

Division

1. Which of the following words and signs make you think of the operation of division? (77)

a	*b*
dividend	sum
÷	$\overline{)\quad}$
n	quotient
divisor	+

2. How would you use multiplication to solve for n in $24\div6=n$? (80)

3. What is the quotient when you divide a number by itself? By 1? (79)

4. Which numbers less than 30 are divisible by 3? By 4? By 5? (91, 92)

5. How do you divide a two-digit number by a one-digit number? (103)

Measures

1. What three measures are called standard units of measure? (113)

2. How many inches are equal in length to 1 foot? To 1 yard? (115)

3. How many pints are equivalent to 1 quart? To 1 gallon? (118)

4. How many ounces are equivalent to 1 pound? (119)

5. How many days are equivalent to 1 week? To 1 year? (121)

Problems

1. How can you decide whether to add, subtract, multiply, or divide to solve a problem? (147)

2. How many steps are used in solving the equation $165-(24+35)=n$? (137)

Fractions

1. In what way is a proper fraction different from an improper fraction? From a mixed fraction? (154, 160)

2. How do you find $\frac{1}{2}$ of 10? $\frac{2}{3}$ of 6? (156, 158)

3. Which pair of fractions, $\frac{1}{2}$ and $\frac{3}{6}$ or $\frac{1}{3}$ and $\frac{3}{6}$, have equal value? (163)

Midyear Tests

Test 1—Number Meanings

Write the word or words in ( ) that make each sentence below true.

1. There are (9, 10, more than 10) counting numbers.

2. The 0 in 101 means no (ones, tens, hundreds).

3. The symbol (I, V, X) is the Roman numeral for 5.

4. The 9 in 8901 means 9 (thousands, hundreds, tens).

5. The numeral (62, 72, 82) represents a value of 6 tens and 12 ones.

Test 2—Addition

Copy. Solve each equation below.

	a	*b*
1.	$19+7=n$	$8+59=n$
2.	$92+16=n$	$99+93=n$
3.	$362+423=n$	$974+215=n$
4.	$897+989=n$	$7642+1325=n$
5.	$4432+9327=n$	$8764+3958=n$

Test 3—Subtraction

Copy. Write each difference.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}86\\-9\\\hline\end{array}$	$\begin{array}{r}75\\-8\\\hline\end{array}$	$\begin{array}{r}89\\-73\\\hline\end{array}$	$\begin{array}{r}65\\-29\\\hline\end{array}$

	a	*b*	*c*
2.	$\begin{array}{r}985\\-342\\\hline\end{array}$	$\begin{array}{r}761\\-349\\\hline\end{array}$	$\begin{array}{r}852\\-396\\\hline\end{array}$
3.	$\begin{array}{r}9328\\-4106\\\hline\end{array}$	$\begin{array}{r}7421\\-3429\\\hline\end{array}$	$\begin{array}{r}8530\\-4876\\\hline\end{array}$

Test 4—Multiplication

Copy. Solve each equation below.

	a	*b*
1.	$3\times32=n$	$5\times40=n$
2.	$2\times28=n$	$4\times53=n$
3.	$4\times58=n$	$3\times321=n$

Copy. Write each product.

a	*b*	*c*	*d*
$\begin{array}{r}824\\\times2\\\hline\end{array}$	$\begin{array}{r}941\\\times6\\\hline\end{array}$	$\begin{array}{r}897\\\times7\\\hline\end{array}$	$\begin{array}{r}934\\\times9\\\hline\end{array}$

Test 5—Division

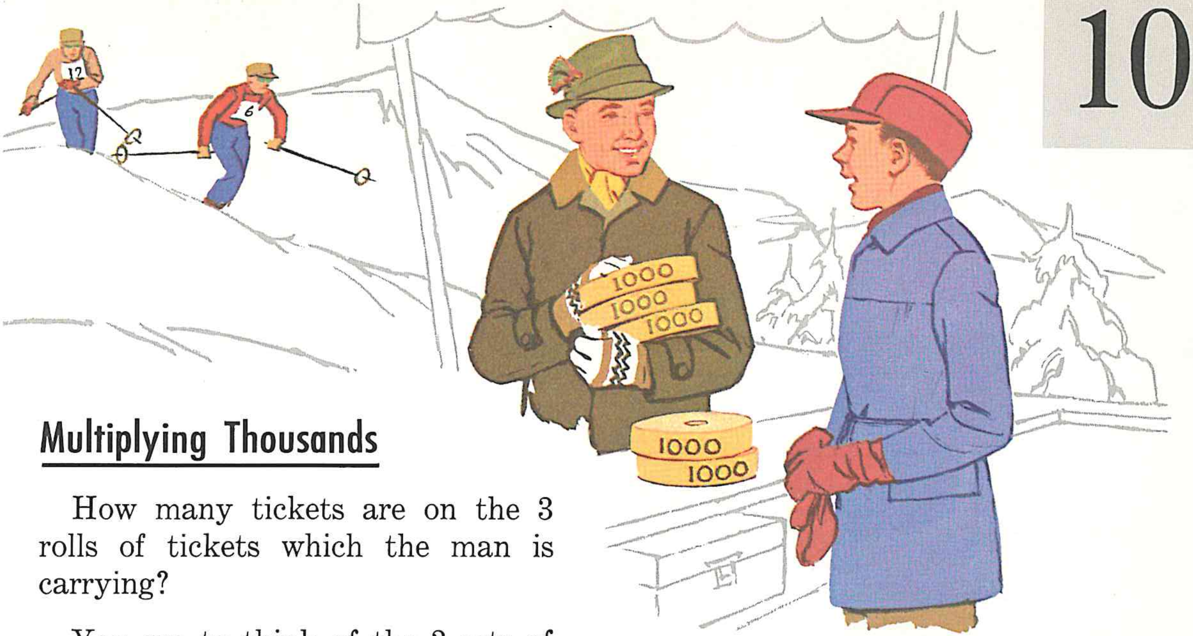
Copy. Solve each equation below.

	a	*b*
1.	$70\div9=n$	$34\div6=n$
2.	$93\div3=n$	$68\div2=n$

Copy. Write each quotient.

	a	*b*	*c*
3.	$4\overline{)89}$	$6\overline{)69}$	$7\overline{)84}$
4.	$5\overline{)75}$	$7\overline{)98}$	$3\overline{)89}$

10



Multiplying Thousands

How many tickets are on the 3 rolls of tickets which the man is carrying?

You are to think of the 3 sets of tickets as being together. Each set has the same number of tickets in it. Therefore you can solve the problem by multiplying 1000 by 3.

You can multiply 1 in thousands place as you multiply 1 in ones place, 1 in tens place, or 1 in hundreds place.

$3\times1=3$	$3\times100=300$
$3\times10=30$	$3\times1000=3000$

Do you see that 3×1 thousand = 3 thousands?

Look at the equation in each row below. How does each product in B differ from the product in A?

A	B
$3\times2=6$	$3\times2000=6000$
$3\times3=9$	$3\times3000=9000$
$3\times4=12$	$3\times4000=12000$
$3\times5=15$	$3\times5000=15000$

What product would you expect in each equation that follows?

$3\times6000=n$	$3\times8000=n$
$3\times7000=n$	$3\times9000=n$

Oral Be ready to tell the value of n in each equation below.

	a	*b*
1.	$4\times2000=n$	$5\times7000=n$
2.	$2\times4000=n$	$4\times5000=n$
3.	$7\times6000=n$	$9\times9000=n$
4.	$9\times4000=n$	$7\times5000=n$
5.	$8\times4000=n$	$8\times9000=n$

Multiplying Four-Digit Numbers

To solve the equation 2×2434=n, think of 2434 as 2000+400+30+4. Then you can multiply as shown below.

	2434	
	×2	
2×4=	8	partial product
2×30=	60	partial product
2×400=	800	partial product
2×2000=	4000	partial product
Add	4868	product

To find a shorter way to multiply 2434 by 2, you may first place all numerals in a grid.

	Th	H	T	O
	2	4	3	4
			×	2
2×4 ones=8 O=				8
2×3 tens=6 T=			6	0
2×4 hundreds=8 H=		8	0	0
2×2 thousands=4 Th=	4	0	0	0
The sum is	4	8	6	8

You will probably solve such equations as 2×2434=n without using a grid. You will also be able to find the product without writing each partial product. Simply multiply the ones, tens, hundreds, and thousands separately as shown.

2434
×2
4868

Oral Tell each partial product and each product found in solving the equations below.

	a	*b*
1.	3×1320=n	4×1210=n
2.	2×4300=n	2×2423=n

Written Copy. Find each product without using the grid.

	a	*b*	*c*	*d*
1.	2413 ×2	3214 ×2	2321 ×3	1221 ×4
2.	3302 ×3	1344 ×2	4032 ×2	2133 ×3

Copy the following multiplications in column form. Write each product. Check by multiplying again.

	a	*b*
3.	5×253=n	3×547=n
4.	5×647=n	7×273=n
5.	6×573=n	9×298=n
6.	8×325=n	9×263=n
7.	4×386=n	6×462=n
8.	7×865=n	4×547=n

Multiplying More Four-Digit Numbers

Multiplying 7568 by 7 requires making changes in the form of ones, tens, hundreds, and thousands. Think of 7568 as 7000+500+60+8. Then you can multiply as shown.

	7568
	×7
7×8=	56
7×60=	420
7×500=	3500
7×7000=	49000
Add	52976

What change in form was made after multiplying the ones? The tens? The hundreds? The thousands? The product is 52,976.

Using the grid may help you do the multiplication a shorter way.

	TTh	Th	H	T	O
		7	5	6	8
				×	7
7×8 O=56 O=				5	6
7×6 T=42 T=			4	2	0
7×5 H=35 H=		3	5	0	0
7×7 Th=49 Th=	4	9	0	0	0
The sum is	5	2	9	7	6

You may be able to do the multiplication without writing each partial product. Study the multiplication used in solving the equation 4×3255=n. In finding the partial products, 2 tens were added to the product of the tens. Why? 2 hundreds were added to the product of the hundreds. Why? 1 thousand was added to the product of the thousands. Why? What is the product of 4×3255?

3255
×4
13020

Oral Tell the steps in finding the value of n in each equation below.

	a	*b*
1.	4×3120 = n	3×2121 = n
2.	2×7042 = n	6×5001 = n

Written Solve the equations in rows 1 and 2 above. Number the rows 1 and 2. Copy each multiplication below. Write each product.

	a	*b*	*c*	*d*
3.	7000 ×4	4120 ×6	5300 ×5	3215 ×3
4.	4363 ×2	2134 ×4	1211 ×5	2305 ×4
5.	2543 ×3	1432 ×6	1312 ×7	2312 ×8
6.	1147 ×9	6298 ×2	2345 ×3	4537 ×5

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Solving Problems

Read each problem carefully. You will either add or multiply the numbers if the question can be answered by putting sets together. You will either subtract or divide if the question in the problem can be answered by removing objects from a set.

Oral Be ready to tell the equation to use in solving each problem below. Tell why you think your equation for each problem is correct.

1. Joan had 96 sheets of cardboard. She put them into piles with 6 sheets in each pile. How many piles of cardboard did she make?

2. Bill counted 39 pencils in a box that had held 144 pencils. How many of the pencils had been taken out of the box?

3. Mary Jo counted the paint brushes in 3 large boxes. One box held 38. Another held 29, and the third held 17 brushes. How many paint brushes did Mary Jo count?

4. If a large plane could fly at a steady rate of 575 miles an hour, how far should it have gone after 6 hours of flying time?

5. There are 1760 yards in a mile. What is the distance in yards that a car travels on a road that is 3 miles long?

6. A truck that weighed 7500 pounds was loaded with 2950 pounds of salt. What was the weight of the truck and its load together?

Written Write the equation for each of the above problems. Solve each equation. Write the answer to the problem.

Something to do Write 5 problems of your own and the equation you would use in solving each one.

Multiplying by Tens

You know how to multiply a number by 1. Multiplying by 10 is almost as easy, for 10 can be thought of as 1 ten. See what happens when you multiply the same number first by 1 and then by 10.

$1\times5=5$ $10\times5=50$
$1\times6=6$ $10\times6=60$
$1\times7=7$ $10\times7=70$
$1\times8=8$ $10\times8=80$

Now see what happens when you multiply a number by 1 ten.

1 ten×1=1 ten, or 10
1 ten×2=2 tens, or 20
1 ten×3=3 tens, or 30
1 ten×4=4 tens, or 40

Do you see that when you multiply a number by 1 ten, you simply write the number and **affix** a zero? That is, you write a 0 after the numeral.

Now see what happens when you multiply by 2 tens.

2 tens×3=6 tens, or 60
2 tens×4=8 tens, or 80
2 tens×5=10 tens, or 100

What product would you expect if you were to multiply 2 by 3 tens? 3 by 4 tens? 4 by 5 tens?

Do you see that when you multiply a number by 2, 3, 4, or more tens, you multiply by the number in tens place and affix a zero?

Oral Answer these questions.

1. What is the product when you multiply 6 by 2 tens? 7 by 2 tens? 8 by 2 tens? 9 by 2 tens?

2. What is the product when you multiply 2 by 30, or 3 tens? 3 by 30, or 3 tens? 4 by 30, or 3 tens?

Written Write each equation below, replacing n in each one with the missing numeral.

	a	*b*
1.	$10\times5=n$	$10\times4=n$
2.	$10\times7=n$	$10\times6=n$
3.	$10\times8=n$	$10\times3=n$
4.	$10\times2=n$	$10\times9=n$

Copy. Replace each __ in the following equations with a numeral.

5. 2 tens×6=__ tens=__

6. 2 tens×3=__tens=__

7. 2 tens×5=__tens=__

8. 2 tens×7=__tens=__

9. 3 tens×2=__tens=__

Multiplying Tens by Tens

See what happens when you multiply tens by tens.

$10\times10=100$
$10\times20=200$
$10\times30=300$
$10\times40=400$

In what way does the product of each multiplication above differ from the number being multiplied?

What product would you expect if you multiplied 50 by 10? 60 by 10?

Do you see that tens multiplied by tens equal hundreds? How would you name a number which you multiplied by 10? Could you simply name the number and affix a 0?

Now look at the equation $20\times20=n$. Can you think of the multiplier as 2×10? If so, you can write the equation like this: $(2\times10)\times20=n$. This becomes $2\times(10\times20)=n$ or $2\times200=n$. The value of n is 400. How would you find the product of 20×30? Of 20×40? Of 20×50?

Oral Be ready to tell the product of each multiplication below.

	a	*b*
1.	$10\times60=n$	$10\times70=n$
2.	$10\times80=n$	$10\times90=n$
3.	$20\times10=n$	$20\times30=n$
4.	$20\times40=n$	$30\times20=n$
5.	$40\times60=n$	$40\times90=n$
6.	$30\times40=n$	$50\times50=n$

Complete each statement below.

7. 1 ten×70=__tens or __
8. 1 ten×90=__tens or __
9. 2 tens×10=__tens or __
10. 2 tens×20=__tens or __
11. 2 tens×30=__tens or __
12. 2 tens×50=__tens or __
13. 2 tens×80=__tens or __
14. 2 tens×90=__tens or __

Written Copy and complete each statement in rows 1 through 14.

Can you do this? Complete each statement below.

1. Ones times ones=__
2. Tens times ones=__
3. Ones times tens=__
4. Tens times tens=__

Multiplying Tens and Ones by Tens

You can multiply 24 by 10 very easily if you think of 24 as 20+4. Then the multiplication can be done as shown.

	24	means 20+4
	×10	means 10 of each
10×4=	40	1st partial product
10×20=	200	2nd partial product
Add	240	product

The multiplication can also be done in a grid as shown. 24 is 2 tens + 4 ones and 10 is 1 ten + 0 ones. First multiply by the ones and then by the tens.

	H	T	O
		2	4
	×	1	0
0 O×4 O=0 O=			0
0 O×2 T=0 T=		0	0
1 T×4 O=4 T=		4	0
1 T×2 T=2 H=	2	0	0
Add	2	4	0

The product is 2 hundreds, 4 tens, and 0 ones or 240.

When there are no ones in the multiplier, there will be no ones in the product. Why? Perhaps you can multiply without writing all of the partial products. To multiply 34 by 20, you may do as many people do. Simply multiply by 2. Move all digits one place to the left, and affix a 0. Why is this possible?

34
×20
680

Oral Tell how you would do each multiplication below, first by using the grid and then without using it.

a	*b*	*c*	*d*
31 ×20	32 ×20	23 ×30	23 ×20

Written Copy. Write each partial product and product.

	a	*b*	*c*	*d*
1.	11 ×60	21 ×40	33 ×30	11 ×90
2.	22 ×40	42 ×20	31 ×20	32 ×20
3.	14 ×20	11 ×50	13 ×10	32 ×30
4.	43 ×20	31 ×10	23 ×20	12 ×40
5.	44 ×10	22 ×30	13 ×20	34 ×10
6.	21 ×30	22 ×20	12 ×20	23 ×10

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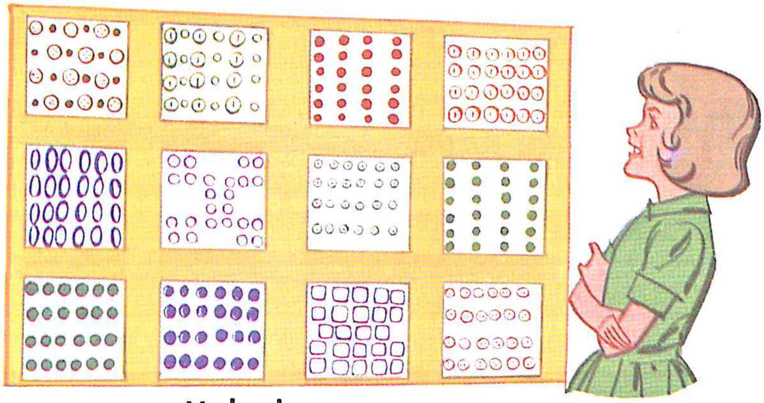

Multiplying a Two-Digit Number by Ones and by Tens

Ann had a collection of old buttons. She had 12 cards with 24 buttons sewed on each card. How many buttons does she have on all of the cards?

You are to think of equal groups as being put together; so you multiply 24 by 12. The grid will be helpful in solving the problem.

	H	T	O
		2	4
	×	1	2
2 O×4 O=8 O=			8
2 O×2 T=4 T=		4	0
1 T×4 O=4 T=		4	0
1 T×2 T=2 H=	2	0	0
Add	2	8	8

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The product is 2 hundreds, 8 tens, and 8 ones or 288. Ann has 288 buttons.

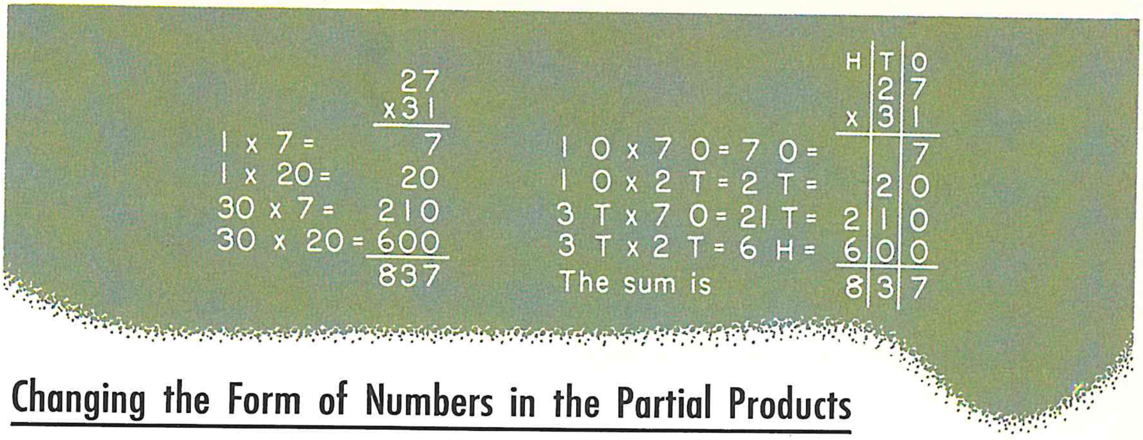
Oral Answer these questions.

1. Were any changes in form made in any of the partial products?

2. In what way is multiplying by tens the same as multiplying by ones?

Written Copy the multiplications below. Write each partial product and product.

	a	*b*	*c*	*d*
1.	12 ×41	81 ×11	18 ×11	11 ×34
2.	21 ×12	53 ×11	12 ×13	26 ×11
3.	22 ×41	24 ×21	11 ×38	12 ×34
4.	21 ×43	32 ×22	11 ×58	22 ×24
5.	14 ×12	61 ×11	11 ×32	11 ×43
6.	55 ×11	17 ×11	22 ×22	14 ×21
7.	11 ×17	12 ×12	28 ×11	11 ×49



27
x31
1 x 7 = 7
1 x 20 = 20
30 x 7 = 210
30 x 20 = 600
837

	H	T	O
		2	7
	x	3	1
1 O x 7 O = 7 O =			7
1 O x 2 T = 2 T =		2	0
3 T x 7 O = 21 T =	2	1	0
3 T x 2 T = 6 H =	6	0	0
The sum is	8	3	7

Changing the Form of Numbers in the Partial Products

The multiplication on the board shows how to multiply 27 by 31. Look especially at the third partial product. 7 ones is multiplied by 3 tens. Why must the form of 21 tens be changed to 2 hundreds, 1 ten, and 0 ones?

Look at the fourth partial product in the multiplication. Do tens times tens equal hundreds?

The illustration below shows how to multiply 48 by 12. Notice the changes in form.

	H	T	O
		4	8
	×	1	2
2 O×8 O=16 O=		1	6
2 O×4 T=8 T=		8	0
1 T×8 O=8 T=		8	0
1 T×4 T=4 H=	4	0	0
Add	5	7	6

How was the form of the first partial product changed?

Oral Be ready to complete each statement below.

	a	*b*
1.	30×3=n	60×7=n
2.	30×4=n	60×9=n

3. 3 tens×3 ones=? tens

4. 3 tens×4 ones=? tens

5. 3 tens×5 ones=? tens

6. 3 tens×2 tens=? hundreds

Written Copy. Write each product.

	a	*b*	*c*	*d*
1.	26 ×31	15 ×61	13 ×73	28 ×21
2.	48 ×21	14 ×72	12 ×84	49 ×21
3.	18 ×12	15 ×13	14 ×13	16 ×12
4.	12 ×38	19 ×12	17 ×15	13 ×35

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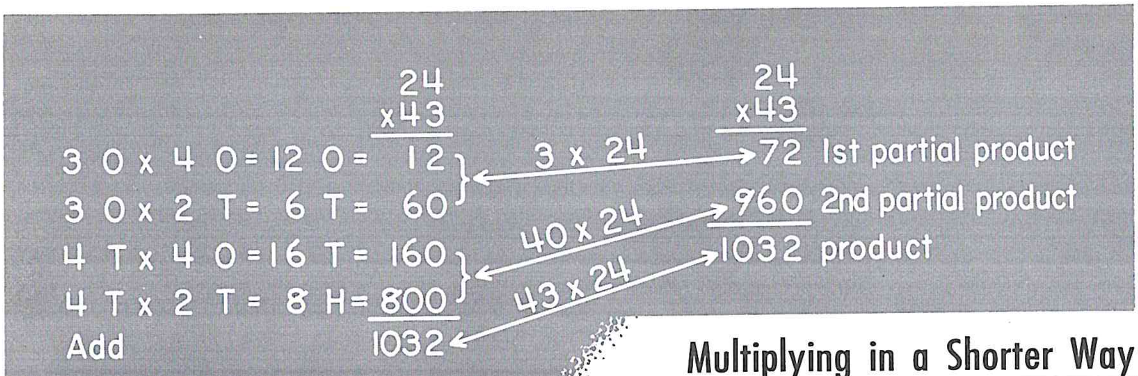
Multiplying in a Shorter Way



The multiplication of 24 by 43 is similar to multiplications you have been doing. You can find the product in either of the two ways shown above. There is still a third way, in which you multiply first by ones and then by tens as shown below.

$$\begin{array}{r} 24 \\ \times 43 \\ \hline 72 \\ 960 \\ \hline 1032 \end{array}$$

Multiply by ones: 3×4=12 ones, or 1 ten and 2 ones. Remember 1 ten. Write 2 in ones place. 3 × 2 tens = 6 tens. 6 tens + 1 ten remembered = 7 tens. Write 7 tens. The first partial product is 72.

Multiply by tens: 4 tens×4 ones= 16 tens, or 1 hundred and 6 tens. Write 6 tens. Remember 1 hundred. 4 tens × 2 tens = 8 hundreds. 8 hundreds+1 hundred remembered= 9 hundreds. Write 9 hundreds. The second partial product is 9 hundreds and 6 tens.

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Add the partial products: 72+960= 1032. The product is 1032.

Oral Tell the product of each multiplication below.

a	*b*	*c*	*d*
24 ×33	17 ×32	15 ×26	37 ×22

Written Copy. Write each product.

	a	*b*	*c*	*d*
1.	17 ×53	19 ×55	13 ×77	16 ×63
2.	19 ×32	12 ×28	39 ×21	13 ×31
3.	13 ×27	17 ×42	12 ×86	28 ×32
4.	18 ×12	15 ×24	29 ×31	14 ×45
5.	16 ×36	19 ×53	30 ×20	60 ×10
6.	15 ×20	29 ×21	13 ×53	14 ×46

	A		B		C	
	53	53	34	34	16	16
	x12	x12	x24	x24	x68	x68
2 O x 3 O = 6 O =	6	106	16	136	48	128
2 O x 5 T = 1 H =	100	530	120	680	80	960
1 T x 3 O = 3 T =	30	636	80	816	360	1088
1 T x 5 T = 5 H =	500		600		600	
Add	636		816		1088	

Practicing Multiplication

Do you see that you need only two partial products in solving each equation above? Because adding zero to a number does not change its value, you do not even need to write the zero in ones place of the second partial product.

16
×68
128
96
1088

No zero needed

Oral Answer these questions.

1. How many digits are used in writing the first partial product in A, B, and C above?

2. How many changes in form were made in writing the first partial product in A? In B? In C?

3. What changes in form were made in writing the second partial product in B?

Written Copy. Write each product.

	a	*b*	*c*	*d*
1.	81 ×12	12 ×81	83 ×13	13 ×83
2.	90 ×12	12 ×90	61 ×15	15 ×61
3.	20 ×48	48 ×20	71 ×17	17 ×71
4.	21 ×39	39 ×21	63 ×13	13 ×63

Write in column form. Solve. Check by multiplying again.

	a	*b*
5.	49×12 = n	36×22 = n
6.	17×29 = n	13×45 = n
7.	49×22 = n	26×44 = n
8.	27×34 = n	26×33 = n
9.	16×19 = n	13×48 = n
10.	24×45 = n	43×28 = n

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More Practice in Multiplication

Each multiplication below is done for you. Each of the four partial products is written to help you see the changes in form that are made.

$$\begin{array}{r} 21 \\ \times 71 \\ \hline 1 \\ 20 \\ 70 \\ 1400 \\ \hline 1491 \end{array} \qquad \begin{array}{r} 21 \\ \times 71 \\ \hline 21 \\ 147 \\ \hline 1491 \end{array} \qquad \begin{array}{r} 22 \\ \times 84 \\ \hline 8 \\ 80 \\ 160 \\ 1600 \\ \hline 1848 \end{array} \qquad \begin{array}{r} 22 \\ \times 84 \\ \hline 88 \\ 176 \\ \hline 1848 \end{array}$$

$$\begin{array}{r} 27 \\ \times 62 \\ \hline 14 \\ 40 \\ 420 \\ 1200 \\ \hline 1674 \end{array} \qquad \begin{array}{r} 27 \\ \times 62 \\ \hline 54 \\ 162 \\ \hline 1674 \end{array} \qquad \begin{array}{r} 49 \\ \times 62 \\ \hline 18 \\ 80 \\ 540 \\ 2400 \\ \hline 3038 \end{array} \qquad \begin{array}{r} 49 \\ \times 62 \\ \hline 98 \\ 294 \\ \hline 3038 \end{array}$$

Oral Be ready to tell how you would do each multiplication above. Use only one partial product when you multiply by ones. Use only one partial product when you multiply by tens.

MORE PRACTICE
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Written Copy in column form. Write each product.

	a	*b*
1.	$61 \times 90 = n$	$31 \times 81 = n$
2.	$52 \times 33 = n$	$41 \times 48 = n$
3.	$21 \times 53 = n$	$30 \times 81 = n$
4.	$64 \times 21 = n$	$21 \times 93 = n$
5.	$43 \times 22 = n$	$92 \times 43 = n$
6.	$84 \times 21 = n$	$63 \times 22 = n$
7.	$32 \times 34 = n$	$83 \times 23 = n$
8.	$71 \times 47 = n$	$33 \times 32 = n$
9.	$91 \times 81 = n$	$71 \times 64 = n$
10.	$61 \times 66 = n$	$21 \times 94 = n$
11.	$63 \times 32 = n$	$92 \times 44 = n$
12.	$94 \times 22 = n$	$52 \times 48 = n$
13.	$74 \times 19 = n$	$42 \times 45 = n$
14.	$28 \times 53 = n$	$35 \times 82 = n$
15.	$43 \times 79 = n$	$26 \times 83 = n$

Can you do this? Jack could not read two of the numerals in his problem when he started to copy it. Can you help him find out what the missing digits should be?

$$\begin{array}{r} \square\,6 \\ \times\ 4\,\square \\ \hline 8\,6\,4 \\ 3\,8\,4 \\ \hline 4\,7\,0\,4 \end{array}$$

Changing the Form of Numbers in Both Partial Products

The multiplications on this page are almost the same as those you have been doing. Do you see which changes in form were made in writing the partial products?

$$\begin{array}{r} 81\\ \times 26\\ \hline 6\\ 480\\ 20\\ 1600\\ \hline 2106 \end{array} \qquad \begin{array}{r} 81\\ \times 26\\ \hline 486\\ 162\\ \hline 2106 \end{array} \qquad \begin{array}{r} 32\\ \times 94\\ \hline 8\\ 120\\ 180\\ 2700\\ \hline 3008 \end{array} \qquad \begin{array}{r} 32\\ \times 94\\ \hline 128\\ 288\\ \hline 3008 \end{array}$$

Oral Be ready to tell how you would do each multiplication above. Use only one partial product when you multiply by ones. Use only one partial product when you multiply by tens.

Written Copy. Write each product. Check by multiplying again.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}30\\ \times 96\\ \hline\end{array}$	$\begin{array}{r}31\\ \times 47\\ \hline\end{array}$	$\begin{array}{r}52\\ \times 61\\ \hline\end{array}$	$\begin{array}{r}81\\ \times 55\\ \hline\end{array}$
2.	$\begin{array}{r}50\\ \times 39\\ \hline\end{array}$	$\begin{array}{r}31\\ \times 61\\ \hline\end{array}$	$\begin{array}{r}60\\ \times 24\\ \hline\end{array}$	$\begin{array}{r}90\\ \times 22\\ \hline\end{array}$
3.	$\begin{array}{r}91\\ \times 67\\ \hline\end{array}$	$\begin{array}{r}80\\ \times 26\\ \hline\end{array}$	$\begin{array}{r}41\\ \times 75\\ \hline\end{array}$	$\begin{array}{r}60\\ \times 84\\ \hline\end{array}$
4.	$\begin{array}{r}72\\ \times 43\\ \hline\end{array}$	$\begin{array}{r}91\\ \times 45\\ \hline\end{array}$	$\begin{array}{r}70\\ \times 59\\ \hline\end{array}$	$\begin{array}{r}81\\ \times 79\\ \hline\end{array}$

Solve each equation below.

	a	*b*
5.	$84 \times 61 = n$	$22 \times 94 = n$
6.	$69 \times 31 = n$	$57 \times 71 = n$
7.	$64 \times 91 = n$	$32 \times 72 = n$
8.	$46 \times 31 = n$	$98 \times 71 = n$
9.	$53 \times 92 = n$	$93 \times 73 = n$
10.	$52 \times 53 = n$	$74 \times 62 = n$
11.	$82 \times 73 = n$	$83 \times 83 = n$
12.	$94 \times 52 = n$	$94 \times 42 = n$
13.	$83 \times 52 = n$	$82 \times 83 = n$
14.	$72 \times 64 = n$	$82 \times 62 = n$
15.	$64 \times 32 = n$	$64 \times 62 = n$

Write an equation for each problem below. Solve the equation.

16. Dick had 9 dozen eggs. He needed 36 more eggs to fill a case of eggs. How many eggs in all did the case hold?

17. A farmer sold all but 37 of his 200 chickens. How many chickens had he sold?

18. A spool had 36 yards of ribbon on it. What was the length of ribbon in inches?

MORE PRACTICE PAGE 310

Practicing Addition, Subtraction, and Division

You should be able to do the work on this page without help.

Part 1 Copy. Write each sum. Check by using subtraction.

	a	*b*	*c*	*d*
1.	32 67 91 +2	8 79 63 +40	37 90 2 +28	$ .96 .03 .84 +.31
2.	326 409 +81	962 890 +415	29 408 +988	$ 6.21 .49 +8.59
3.	209 591 327 +905	711 867 29 +103	307 723 413 +64	$ 7.98 1.89 .37 +5.12
4.	1620 3907 483 +4093	1781 3409 2315 +7515	2088 4198 2312 +619	$21.70 16.19 4.10 +58.51

Part 2 Copy. Write each difference. Check by using addition.

	a	*b*	*c*	*d*
1.	62 −46	75 −28	851 −139	$ 6.07 −5.68
2.	8720 −512	5379 −736	6325 −429	$36.98 −2.89
3.	7668 −2849	5608 −1219	9243 −5867	$40.01 −28.46

Part 3 Copy. Write each quotient. Check by using multiplication.

	a	*b*	*c*	*d*
1.	$6\overline{)36}$	$2\overline{)14}$	$9\overline{)27}$	$7\overline{)49}$
2.	$2\overline{)46}$	$5\overline{)55}$	$4\overline{)80}$	$3\overline{)69}$
3.	$4\overline{)52}$	$8\overline{)96}$	$3\overline{)72}$	$6\overline{)90}$
4.	$6\overline{)52}$	$9\overline{)35}$	$5\overline{)22}$	$7\overline{)34}$
5.	$5\overline{)59}$	$3\overline{)43}$	$6\overline{)82}$	$8\overline{)89}$
6.	$9\overline{)98}$	$7\overline{)97}$	$8\overline{)89}$	$5\overline{)97}$

Part 4 Solve the following equations. Check each sum, difference, and quotient.

	a	*b*
1.	(6+4)÷2=n	6+(4÷2)=n
2.	12+(19−7)=n	(12+19)−7=n
3.	46−(31+2)=n	(46−31)+2=n
4.	84÷(6−2)=n	(84÷6)−2=n
5.	(7÷7)+4=n	17+(18÷3)=n
6.	84−(69+7)=n	(48÷8)+18=n
7.	(6+26)÷4=n	32+(9−4)=n
8.	(124−25)÷3=n	(18÷9)+30=n
9.	220−(3+10)=n	(38+20)−4=n

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. The number of ones, tens, hundreds, and thousands can be multiplied separately in a four-digit number. (176)

2. To multiply a number by 10, you simply name the number and affix a 0. (179)

3. To multiply a number by 2, 3, 4, or more tens, you multiply by the number in tens place and affix a zero. (179)

4. Tens multiplied by tens equal hundreds. (180)

Words to Know

Affix (179)

Questions to Discuss

1. When you have a problem to solve, how can you decide when to multiply numbers? (175, 178)

2. How can you avoid writing each partial product? (176)

3. How would you solve the equation $26 \times 81 = n$? (187)

4. In what way is multiplying by tens the same as multiplying by ones? (179, 180)

Written Practice

Copy in column form. Write each product.

	a	*b*	
1.	$9 \times 4000 = n$	$8 \times 7000 = n$	(175)
2.	$4 \times 7524 = n$	$9 \times 6537 = n$	(177)
3.	$10 \times 9 = n$	$10 \times 7 = n$	(179)
4.	$10 \times 30 = n$	$20 \times 80 = n$	(180)
5.	$30 \times 22 = n$	$20 \times 12 = n$	(181)
6.	$24 \times 22 = n$	$34 \times 11 = n$	(182)
7.	$29 \times 21 = n$	$24 \times 23 = n$	(183)
8.	$33 \times 26 = n$	$53 \times 19 = n$	(184)
9.	$12 \times 86 = n$	$23 \times 49 = n$	(185)
10.	$29 \times 28 = n$	$49 \times 42 = n$	(186)
11.	$43 \times 73 = n$	$32 \times 64 = n$	(187)

Solve these problems.

12. A mile is equivalent to 5280 feet. What is the altitude in feet of an airplane flying at a height of 6 miles? (176)

13. A truck was loaded with 48 baskets of fruit. Each basket weighed 44 pounds. What was the weight of the load of fruit? (182)

Self-Evaluation

Part 1 Copy. Solve each equation.

	a	*b*
1.	$4756+3987=n$	$n-197=350$
2.	$n-3119=1000$	$4001-958=n$
3.	$n\times87=261$	$9\times n=108$
4.	$72\div n=9$	$91\div5=n$
5.	$n+751=1978$	$3275-n=1467$
6.	$n\div7=21$	$n+625=8170$

Part 2 Copy. Replace each blank in these exercises with the missing numeral. The sign = is used to mean *is equivalent to.*

1. 7530 ft. = __mi.__ft.

2. 4350 lb. = __T.__lb.

3. 32 gal. = __qt.

4. 41 in. = __yd.__in.

5. 30 pt. = __qt.

6. 37 da. = __wk.__da.

7. 90 min. = __hr.__min.

8. 15 mo. = __yr.__mo.

9. 7 mi. = __ft.

10. 35 yd. = __in.

Part 3 Copy. Write each product.

	a	*b*
1.	$6\times7589=n$	$9\times8542=n$
2.	$20\times30=n$	$30\times32=n$
3.	$12\times12=n$	$11\times72=n$
4.	$24\times22=n$	$32\times32=n$
5.	$27\times42=n$	$51\times36=n$
6.	$61\times15=n$	$42\times24=n$
7.	$37\times13=n$	$14\times14=n$
8.	$32\times37=n$	$23\times16=n$
9.	$35\times26=n$	$87\times14=n$
10.	$47\times86=n$	$92\times85=n$

Part 4 Solve these problems.

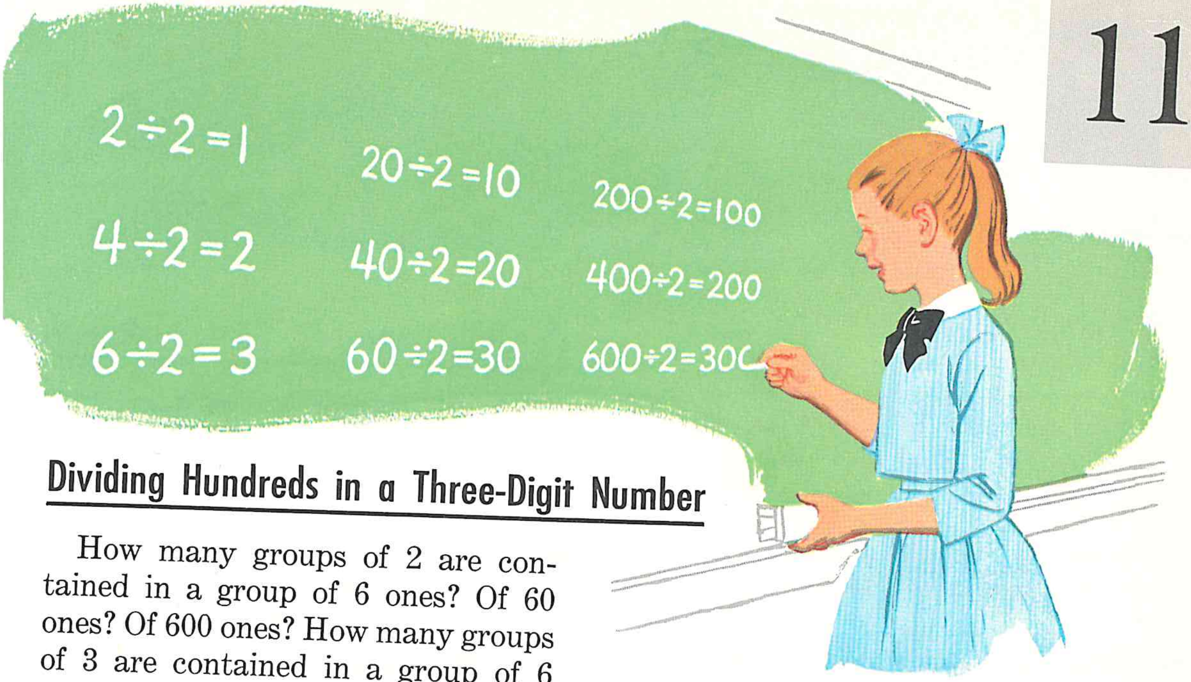
1. Beverly used $\frac{3}{4}$ of a yard of material. What was the length of the material in inches?

2. A small plane was flying at an altitude of $\frac{1}{2}$ mile. What was its altitude in feet?

3. Mary bought $\frac{2}{3}$ of a yard of material that cost \$.69 a yard. What did the material cost?

4. Bob had \$1.50 and decided to save $\frac{1}{3}$ of it. How much did he plan to save?

11



Dividing Hundreds in a Three-Digit Number

How many groups of 2 are contained in a group of 6 ones? Of 60 ones? Of 600 ones? How many groups of 3 are contained in a group of 6 ones? Of 60 ones? Of 600 ones?

To divide 800 by 2, you think of 800 as 8 hundreds. Then you can divide as shown.

$$\begin{array}{rl} 4 & \text{hundreds} \\ 2\overline{)8} & \text{hundreds} \\ \underline{8} & \text{hundreds} \\ 0 & \end{array} \qquad \text{or} \qquad \begin{array}{r} 400 \\ 2\overline{)800} \\ \underline{800} \\ 000 \end{array}$$

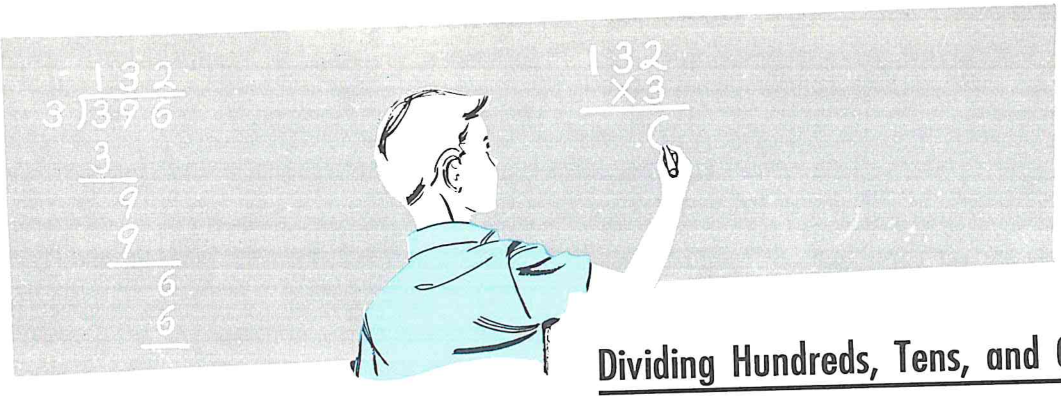
Why is there a 0 in tens place and in ones place in the quotient when you divide 800 by 2?

Oral Read. Supply the missing number word.

1. 8 tens÷2=__tens
2. 8 hundreds÷2=__hundreds
3. 6 tens÷3=__tens
4. 6 hundreds÷3=__hundreds
5. 9 tens÷3=__tens
6. 9 hundreds÷3=__hundreds
7. 8 tens÷4=__tens
8. 8 hundreds÷4=__hundreds

Written Copy, using the sign $\overline{)\quad}$. Write each quotient. Check each division by multiplying.

	a	*b*
1.	600÷2=n	600÷n=2
2.	900÷3=n	900÷n=3
3.	800÷8=n	800÷4=n
4.	400÷4=n	700÷7=n



Dividing Hundreds, Tens, and Ones

One way to solve the equation $396 \div 3 = n$ is shown below.

$$\begin{array}{rllllll} & 1 & \text{hundred} & 3 & \text{tens} & 2 & \text{ones} \\ \cline{2-7} 3) & 3 & \text{hundreds} & 9 & \text{tens} & 6 & \text{ones} \\ & 3 & \text{hundreds} & \downarrow & & \downarrow & \\ \cline{2-3} & 0 & & 9 & \text{tens} & & \\ & & & 9 & \text{tens} & & \\ \cline{4-5} & & & 0 & & 6 & \text{ones} \\ & & & & & 6 & \text{ones} \\ \cline{6-7} & & & & & 0 & \end{array}$$

The quotient is 1 hundred, 3 tens, and 2 ones, or 132.

You are more likely to divide as shown. First you divide the hundreds, then the tens, and then the ones. When the remainder in any subtraction is 0, the 0 is not written. Why is the 1 of the quotient written in hundreds place? Do you divide hundreds in the same way as ones? In the same way as tens?

$$\begin{array}{r} 132 \\ 3\overline{)396} \\ \underline{3} \\ 9 \\ \underline{9} \\ 6 \\ \underline{6} \end{array}$$

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Oral Be ready to explain each division below.

a

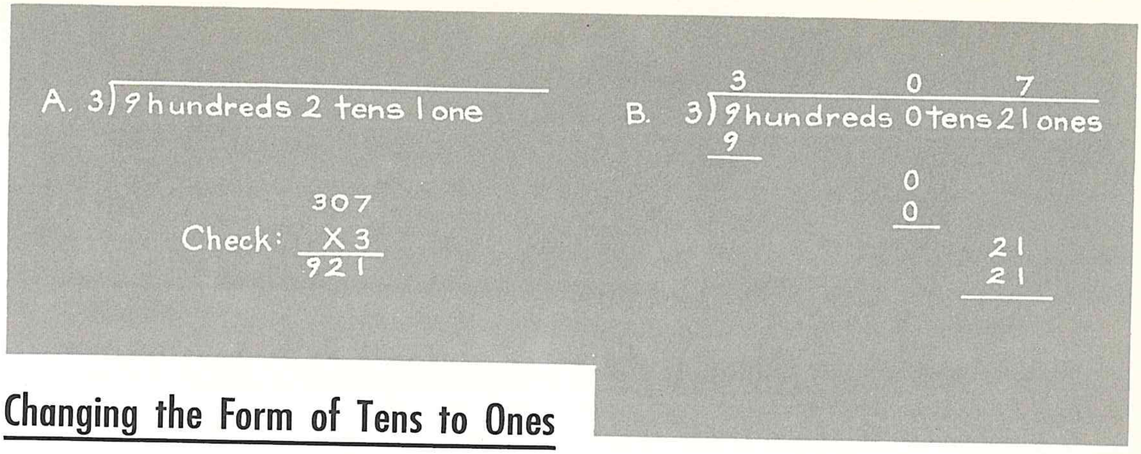
$$\begin{array}{r} 230\text{ r}1 \\ 3\overline{)691}\phantom{\text{ r}1} \\ \underline{6}\phantom{91\text{ r}1} \\ 9\phantom{1\text{ r}1} \\ \underline{9}\phantom{1\text{ r}1} \\ 1\phantom{\text{ r}1} \end{array}$$

b

$$\begin{array}{r} 121\text{ r}2 \\ 4\overline{)486}\phantom{\text{ r}2} \\ \underline{4}\phantom{86\text{ r}2} \\ 8\phantom{6\text{ r}2} \\ \underline{8}\phantom{6\text{ r}2} \\ 6\phantom{\text{ r}2} \\ \underline{4}\phantom{\text{ r}2} \\ 2\phantom{\text{ r}2} \end{array}$$

Written Copy. Write each quotient. Check by multiplying.

	a	*b*	*c*
1.	$4\overline{)840}$	$2\overline{)480}$	$3\overline{)390}$
2.	$3\overline{)960}$	$2\overline{)640}$	$7\overline{)770}$
3.	$4\overline{)885}$	$3\overline{)693}$	$2\overline{)843}$
4.	$2\overline{)261}$	$2\overline{)468}$	$3\overline{)368}$
5.	$5\overline{)553}$	$4\overline{)448}$	$6\overline{)667}$
6.	$3\overline{)632}$	$5\overline{)555}$	$4\overline{)845}$
7.	$4\overline{)441}$	$3\overline{)936}$	$2\overline{)485}$
8.	$2\overline{)461}$	$2\overline{)264}$	$3\overline{)697}$



A. $3\overline{)9 \text{ hundreds } 2 \text{ tens } 1 \text{ one}}$

$$\text{Check: } \begin{array}{r} 307 \\ \underline{\times 3} \\ 921 \end{array}$$

$$\text{B. } \begin{array}{rlll} & 3 & 0 & 7 \\ 3\,\big) & \overline{9 \text{ hundreds}} & \overline{0 \text{ tens}} & \overline{21 \text{ ones}} \\ & \underline{9} & & \\ & & 0 & \\ & & \underline{0} & \\ & & & 21 \\ & & & \underline{21} \end{array}$$

Changing the Form of Tens to Ones

In the equation 921÷3=n, there are enough hundreds to divide. However, the 2 of 2 tens is not divisible by 3. The tens are changed to ones and added to the one, as shown in B above. Can 21 ones be divided by 3?

Oral Study the divisions below.

a	*b*	*c*
$\begin{array}{r} 301 \\ 3\overline{)903} \\ \underline{9} \\ 03 \\ \underline{3} \end{array}$	$\begin{array}{r} 205 \\ 4\overline{)820} \\ \underline{8} \\ 20 \\ \underline{20} \end{array}$	$\begin{array}{r} 205 \text{ r}1 \\ 4\overline{)821} \\ \underline{8} \\ 21 \\ \underline{20} \\ 1 \end{array}$

Answer these questions.

1. Why is there a zero in tens place in the quotient of each division above?

2. What change in form was made in *b*? In *c*?

3. How would you check the division in *a*? How would you check the division in *c*?

Tell the quotient for each division below.

	a	*b*	*c*
4.	$6\overline{)606}$	$4\overline{)808}$	$2\overline{)802}$
5.	$3\overline{)609}$	$3\overline{)906}$	$4\overline{)408}$

Written Copy. Write each quotient.

	a	*b*	*c*
1.	$3\overline{)321}$	$4\overline{)412}$	$2\overline{)209}$
2.	$8\overline{)864}$	$3\overline{)304}$	$7\overline{)758}$
3.	$7\overline{)708}$	$5\overline{)545}$	$5\overline{)533}$
4.	$4\overline{)809}$	$6\overline{)630}$	$4\overline{)835}$
5.	$6\overline{)629}$	$7\overline{)742}$	$2\overline{)403}$

MORE PRACTICE
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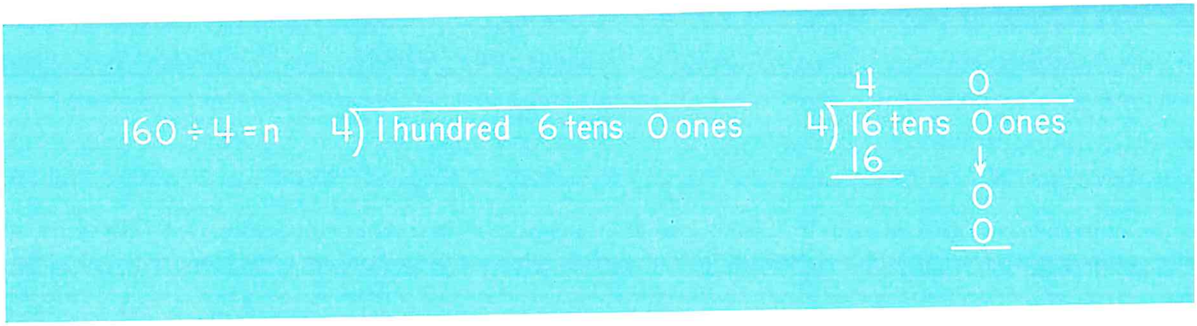
Something to do Make up problems of your own, using the following equations.

	a	*b*
1.	375÷3=n	144÷6=n
2.	225÷7=n	500÷8=n

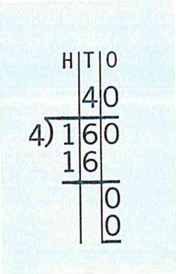


Changing the Form of Hundreds to Tens in Division

Can the 1 in the hundreds place be divided by 4?

The answer to this question is *no*. However, the form of 1 hundred can be changed to tens. When this is done, the tens are added to those already in tens place.

You can probably solve the equation $160 \div 4 = n$ as shown. Why is the 4 of the quotient written in tens place? Why is the 0 written in ones place? What is the remainder of the completed division? The quotient is 4 tens and 0 ones, or 40.



MORE PRACTICE PAGE 311

Oral Read. Supply the missing number word, using the largest possible number of tens.

1. 100 = ___ tens
2. 120 = ___ tens
3. 240 = ___ tens
4. 350 = ___ tens
5. 720 = ___ tens

Written Copy, using the sign $\overline{)\quad}$. Write each quotient. Check by using multiplication.

	a	*b*
1.	$270 \div 3 = n$	$270 \div 9 = n$
2.	$320 \div 8 = n$	$320 \div 4 = n$
3.	$420 \div 7 = n$	$480 \div 6 = n$
4.	$240 \div 6 = n$	$200 \div 4 = n$
5.	$100 \div 5 = n$	$240 \div 3 = n$
6.	$240 \div 4 = n$	$480 \div 8 = n$
7.	$350 \div 7 = n$	$180 \div 6 = n$

A quick review

	a	*b*
1.	$5 \times 5280 = n$	$9 \times 1760 = n$
2.	$45 \times 72 = n$	$38 \times 47 = n$
3.	$(64 - 13) + 8 = n$	$64 - (13 + 8) = n$

Dividing Tens and Ones in Three-Digit Numbers

To solve the equation $205 \div 5 = n$, you can think of 205 as $200+5$. Then you can divide 205 by 5 as shown below.

$$\begin{aligned} 205 \div 5 &= (200+5) \div 5 \\ &= (200 \div 5) + (5 \div 5) \\ &= \quad 40 \quad + \quad 1 \\ &= \qquad 41 \end{aligned}$$

You can also divide 205 by 5 like this.

First try to divide the 2 in hundreds place. You cannot, because the 2 of the 2 hundreds is not divisible by 5. Change the form of 2 hundreds to 20 tens. Then divide the tens. Next divide the ones.

$$\begin{array}{r} 41 \\ 5\overline{)205} \\ \underline{20} \\ 5 \\ \underline{5} \end{array}$$

You solve the equation $208 \div 5 = n$ in the same way as $205 \div 5 = n$. Only now there is a remainder of ones. What is the remainder?

Oral Tell how you would solve each equation below.

	a	*b*
1.	$546 \div 6 = n$	$309 \div 3 = n$
2.	$428 \div 7 = n$	$275 \div 3 = n$
3.	$288 \div 4 = n$	$325 \div 4 = n$

Written Copy. Write each quotient. Check by multiplying.

	a	*b*	*c*
1.	$9\overline{)459}$	$4\overline{)168}$	$9\overline{)369}$
2.	$4\overline{)128}$	$3\overline{)186}$	$2\overline{)102}$
3.	$9\overline{)819}$	$5\overline{)405}$	$7\overline{)289}$
4.	$6\overline{)367}$	$8\overline{)489}$	$4\overline{)247}$
5.	$5\overline{)458}$	$3\overline{)127}$	$6\overline{)426}$
6.	$3\overline{)249}$	$5\overline{)356}$	$2\overline{)105}$
7.	$3\overline{)278}$	$6\overline{)309}$	$8\overline{)648}$
8.	$3\overline{)213}$	$5\overline{)407}$	$4\overline{)169}$
9.	$4\overline{)209}$	$7\overline{)638}$	$2\overline{)149}$
10.	$8\overline{)729}$	$4\overline{)366}$	$7\overline{)498}$
11.	$2\overline{)183}$	$6\overline{)485}$	$9\overline{)278}$

Can you do this? Solve the divisions below by replacing each dot with the digit for which it stands.

a

$$\begin{array}{r} \bullet\bullet \\ \bullet\overline{)\bullet\bullet 2} \\ \underline{7} \\ \bullet 2 \\ \underline{\bullet 2} \\ 0 \end{array}$$

b

$$\begin{array}{r} 2\bullet\bullet \\ \bullet\overline{)\bullet\bullet 5} \\ \underline{\bullet} \\ \bullet 5 \\ \underline{\bullet\bullet} \\ 0 \end{array}$$

MORE PRACTICE PAGE 312

Changing the Form of Hundreds to Tens and Tens to Ones in Division

In solving the equation $462 \div 6 = n$, you cannot divide the digit 4 in hundreds place by 6. The form of 4 hundreds is changed to 40 tens and added to the tens. Then the division is done as shown.

$$
\begin{array}{rl}
 & 7 \text{ tens } 7 \text{ ones} \\
6 & \overline{)46 \text{ tens } 2 \text{ ones}} \\
 & \underline{42} \\
 & \text{④} \longrightarrow {}^{4}2 \\
 & \phantom{④ \longrightarrow {}}\underline{42}
\end{array}
$$

In shorter form the equation $462 \div 6 = n$ is solved as shown. Why don't you have to show each change in form as you work?

$$
\begin{array}{r}
77 \\
6\overline{)462} \\
\underline{42} \\
42 \\
\underline{42}
\end{array}
$$

Oral Tell how you would solve the equation $459 \div 6 = n$. Why is there a remainder?

Written Copy. Write each quotient. Check by using multiplication.

MORE PRACTICE PAGE 312

	a	*b*	*c*
1.	$5\overline{)370}$	$9\overline{)738}$	$4\overline{)104}$
2.	$6\overline{)504}$	$3\overline{)102}$	$4\overline{)332}$
3.	$2\overline{)112}$	$3\overline{)268}$	$4\overline{)390}$
4.	$7\overline{)406}$	$4\overline{)268}$	$3\overline{)117}$
5.	$7\overline{)234}$	$9\overline{)427}$	$2\overline{)135}$
6.	$8\overline{)136}$	$6\overline{)139}$	$6\overline{)478}$

Copy, using the sign $\overline{)}$. Write each quotient. Check by multiplying.

	a	*b*
7.	$312 \div 4 = n$	$590 \div 7 = n$
8.	$584 \div 8 = n$	$576 \div 6 = n$
9.	$740 \div 9 = n$	$184 \div 8 = n$
10.	$325 \div 6 = n$	$193 \div 2 = n$
11.	$445 \div 6 = n$	$506 \div 7 = n$
12.	$288 \div 3 = n$	$220 \div 4 = n$
13.	$739 \div 8 = n$	$225 \div 5 = n$
14.	$231 \div 3 = n$	$174 \div 2 = n$

Write the equation for each problem below. Solve the equation.

15. Paul had one ball of kite string containing 15 yards and one containing 27 yards. He gave Alan half of all his string. How many yards of string did he give Alan?

16. Mrs. Olson had 5 quarts of preserves in one kettle and 4 quarts in another. She put the preserves into pint jars. How many pint jars did she fill?

Changing the Form of a Remainder of Hundreds

A factory had spaces for 968 cars in 8 lots. There were the same number of spaces on each lot. How many cars could park on each lot?

The equation is $968 \div 8 = n$. Why? You can solve the equation as shown below.

$$\begin{array}{rllll}
 & 1 \text{ hundred} & 2 \text{ tens} & 1 \text{ one} \\
8) & \overline{9 \text{ hundreds}} & \overline{6 \text{ tens}} & \overline{8 \text{ ones}} \\
 & \underline{8} & & \\
 & \text{①} \longrightarrow & {}^{1}6 & \\
 & & \underline{16} & \\
 & & & 8 \\
 & & & \underline{8}
\end{array}$$

What was the remainder of hundreds after the hundreds were divided? Why were there 16 tens to be divided? What was the remainder of tens after the tens were divided? What was done to the 8 ones?

When you divide 968 by 8, the quotient is 1 hundred, 2 tens, and 1 one, or 121.

$$\begin{array}{r}
121 \\
8\overline{)968} \\
\underline{8} \\
16 \\
\underline{16} \\
8 \\
\underline{8}
\end{array}$$

The division is usually done as shown. What would the quotient and the remainder have been if the dividend had been 969?

Oral Be ready to tell the changes in form needed to find each quotient below.

	a	*b*
1.	$\begin{array}{r} 160 \\ 4\overline{)640} \\ \underline{4} \\ 24 \\ \underline{24} \end{array}$	$\begin{array}{r} 160 \text{ r}2 \\ 4\overline{)642} \\ \underline{4} \\ 24 \\ \underline{24} \\ 2 \end{array}$
2.	$\begin{array}{r} 245 \\ 3\overline{)735} \\ \underline{6} \\ 13 \\ \underline{12} \\ 15 \\ \underline{15} \end{array}$	$\begin{array}{r} 245 \text{ r}2 \\ 3\overline{)737} \\ \underline{6} \\ 13 \\ \underline{12} \\ 17 \\ \underline{15} \\ 2 \end{array}$

Written Copy. Write each quotient. Check by using multiplication.

	a	*b*	*c*
1.	$5\overline{)720}$	$8\overline{)976}$	$6\overline{)893}$
2.	$4\overline{)632}$	$7\overline{)891}$	$3\overline{)570}$
3.	$8\overline{)907}$	$4\overline{)707}$	$9\overline{)982}$

Copy, using the sign $\overline{)}$. Find each quotient. Check.

	a	*b*
4.	$834 \div 5 = n$	$938 \div 7 = n$
5.	$839 \div 6 = n$	$782 \div 4 = n$

MORE PRACTICE
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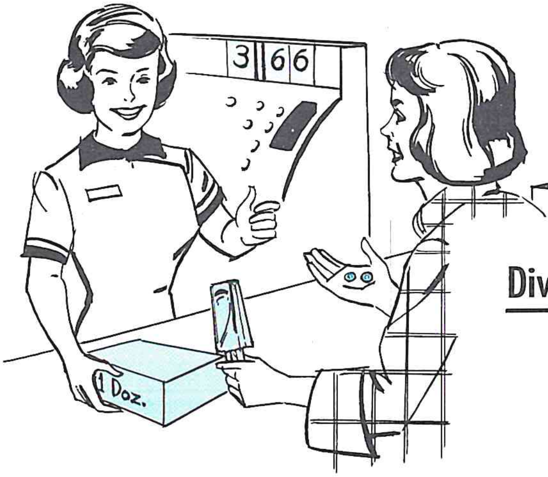
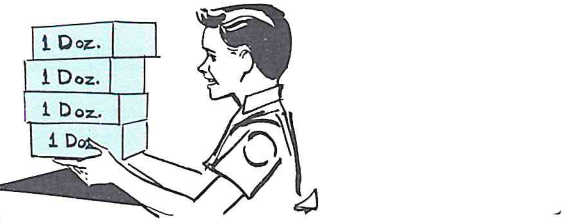




1 Doz.
1 Doz.
1 Doz.
1 Doz.

Dividing Numbers That Stand for Money

Mrs. Allen had \$3.68 to spend for popsicles for a picnic. The popsicles cost \$.06 each. How many could she buy?

You are to think of \$3.68 as being rearranged into groups each to contain \$.06. You are to find how many equal groups; so you divide the numbers. The equation is $368 \div 6 = n$. Why don't you use the signs \$ and . in the equation?

You may solve the equation in either way shown below.

$$
\begin{array}{r}
61 \text{ r}2 \\
6\overline{)368} \\
\underline{36} \\
8 \\
\underline{6} \\
2
\end{array}
\quad \text{or} \quad
\begin{array}{r}
61 \text{ r}2¢ \\
\$.06\overline{)\$3.68} \\
\underline{3\,6} \\
8 \\
\underline{6} \\
2
\end{array}
$$

Mrs. Allen can buy 61 popsicles. She will have 2¢ left over. Is the sign \$ needed in the answer?

Oral Answer these questions.

1. Why might you want to use the signs \$ and . when dividing numbers that stand for money?

2. Why wasn't the quotient of \$3.68 divided by \$.06 written as dollars and cents? Why was the remainder written as cents?

3. How would you check the division of \$7.58 by \$.04?

Written Copy. Write each answer. Check.

	a	*b*
1.	$\$.04\overline{)\$2.00}$	$\$.08\overline{)\$4.00}$
2.	$\$.09\overline{)\$6.39}$	$\$.04\overline{)\$3.68}$
3.	$\$.05\overline{)\$3.59}$	$\$.08\overline{)\$6.49}$

Copy. Write each answer. Check.

	a	*b*
4.	$918 \div 3 = n$	$436 \div 4 = n$
5.	$824 \div 4 = n$	$756 \div 7 = n$
6.	$950 \div 9 = n$	$613 \div 2 = n$
7.	$920 \div 3 = n$	$829 \div 4 = n$

Finding the Amount of Money in Equal Groups of Equal Size

Mary, Jane, and Anne gave a party. The girls paid $1.95 for refreshments. Each girl paid the same amount. What was each girl's share of the cost?

You are to think of the money as rearranged into 3 groups of equal size, and you are to find how much money is in each group; so you divide the numbers. The equation is 195÷3=n. Why?

You may solve the equation in either way shown below.

$$\begin{array}{ccc} \textbf{A} & & \textbf{B} \\ \begin{array}{r} 39 \\ 5\overline{)195} \\ \underline{15} \\ 45 \\ \underline{45} \end{array} & \text{or} & \begin{array}{r} \$\ .39 \\ 5\overline{)\$1.95} \\ \underline{1\ 5} \\ 45 \\ \underline{45} \end{array} \end{array}$$

Each girl must pay $.39.

Oral Answer these questions.

1. How do you know that the answer must be in cents?

2. In B, are the $ and . signs in a straight column in the quotient and the dividend?

3. How should you write the remainder when you divide $1.97 by 5?

Written Copy. Write each quotient. Check.

	a	*b*
1.	$8\overline{)\$4.88}$	$4\overline{)\$5.60}$
2.	$7\overline{)\$5.60}$	$3\overline{)\$2.49}$
3.	$2\overline{)\$7.20}$	$6\overline{)\$3.45}$
4.	$5\overline{)\$9.75}$	$3\overline{)\$2.58}$
5.	$4\overline{)\$7.80}$	$4\overline{)\$3.98}$

Copy. Write each quotient. Check.

	a	*b*	*c*
6.	$2\overline{)814}$	$5\overline{)540}$	$9\overline{)972}$
7.	$3\overline{)327}$	$6\overline{)627}$	$4\overline{)415}$
8.	$6\overline{)657}$	$2\overline{)815}$	$2\overline{)680}$
9.	$3\overline{)960}$	$3\overline{)932}$	$6\overline{)662}$
10.	$2\overline{)468}$	$4\overline{)844}$	$5\overline{)559}$
11.	$3\overline{)698}$	$5\overline{)560}$	$6\overline{)684}$
12.	$5\overline{)585}$	$2\overline{)898}$	$3\overline{)387}$
13.	$5\overline{)595}$	$3\overline{)985}$	$5\overline{)570}$
14.	$6\overline{)698}$	$3\overline{)685}$	$2\overline{)853}$
15.	$3\overline{)979}$	$5\overline{)592}$	$8\overline{)899}$
16.	$6\overline{)675}$	$2\overline{)639}$	$3\overline{)918}$

Reviewing Addition, Subtraction, Multiplication, and Division

Part 1 Copy. Write each sum. Check by adding another way.

	a	*b*	*c*
1.	9000 3500 9785 +7694	8708 7070 6990 +2480	$44.00 50.55 69.56 +93.68
2.	7389 5040 6306 +7507	8790 7806 6705 +5634	$27.67 20.40 57.49 +66.00
3.	8763 7420 2009 +1955	3005 2654 1864 +5078	$10.63 16.44 82.09 +13.75
4.	1034 6409 2326 +4090	2051 1230 2895 +1926	$54.48 25.00 60.20 +46.47

Part 2 Copy. Write each difference. Check by adding.

	a	*b*
1.	$4900-923=n$	$6402-745=n$
2.	$4831-879=n$	$5304-959=n$
3.	$7020-2836=n$	$5006-1899=n$
4.	$6042-4675=n$	$5200-2449=n$
5.	$9700-2718=n$	$8000-3739=n$
6.	$6062-3487=n$	$8010-5742=n$

Part 3 Copy. Write each product. Check by multiplying again.

	a	*b*
1.	$3\times65=n$	$5\times48=n$
2.	$2\times89=n$	$8\times24=n$
3.	$9\times32=n$	$7\times22=n$
4.	$3\times99=n$	$4\times65=n$
5.	$10\times20=n$	$40\times11=n$
6.	$59\times10=n$	$24\times20=n$
7.	$21\times43=n$	$23\times23=n$
8.	$42\times25=n$	$33\times25=n$
9.	$73\times29=n$	$45\times99=n$

Part 4 Copy. Write each quotient. Check by using multiplication.

	a	*b*
1.	$80\div2=n$	$49\div4=n$
2.	$66\div3=n$	$99\div5=n$
3.	$96\div6=n$	$79\div7=n$
4.	$280\div7=n$	$720\div9=n$
5.	$219\div3=n$	$546\div6=n$
6.	$900\div9=n$	$609\div3=n$
7.	$807\div4=n$	$955\div6=n$
8.	$649\div3=n$	$541\div2=n$

Solving Problems

Read each problem carefully. Decide upon the equation you would use in solving it.

1. Jane bought 5 pairs of socks at \$.29 a pair. How much change should she receive from \$2.00?

2. A farmer wants to plant 160 cherry trees in 5 rows. How many trees can he plant in each row?

3. The school store sold 9 big notebooks at 25¢ each during the first week of November. How much did the store get for all of the notebooks?

4. A storekeeper bought 12 packages of notebook paper at \$.62 a package. How much did he pay?

5. Bob raised 248 melons in his garden last year. When he sold them, he packed 8 melons in a box. How many boxes did he use?

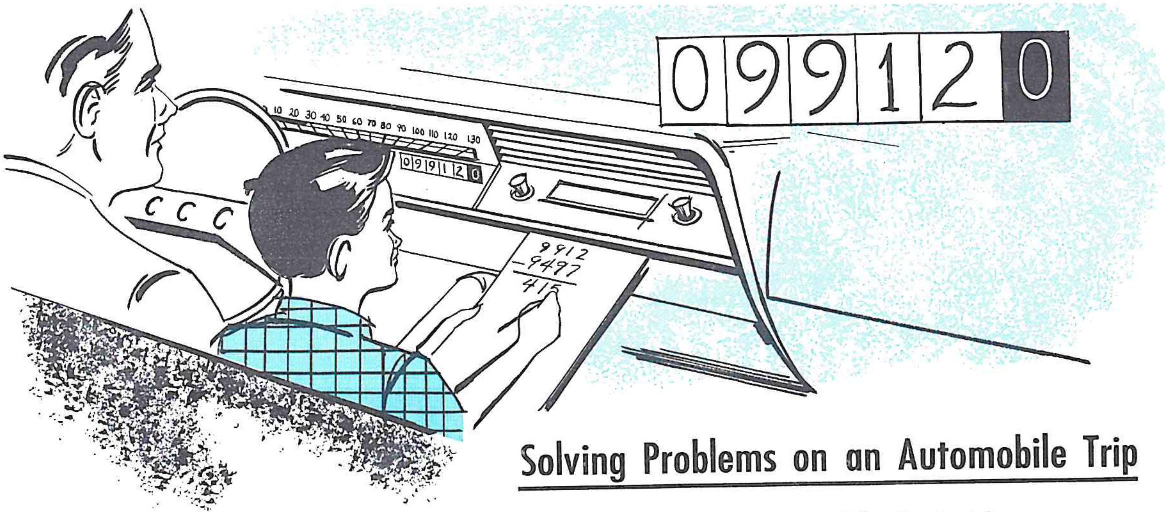
6. Ann's father had to drive 890 miles to Boston. He drove 376 miles the first day and 298 miles the second day. How many miles did he still have to drive?

7. Betty received \$.25 an hour for baby sitting. One month she worked 19 hours. How much more money did she need to buy a sweater that cost \$5.98?

8. Arthur's father gave him \$1 for spending money. Arthur spent \$.25 for a show, \$.10 for popcorn, and \$.10 for carfare. How much money did he have left?

Oral Be ready to tell the equation you would use in solving each problem above and why you decided to use it.

Written Write the equation for each problem on this page. Solve it. Read the problem to see if your answer is sensible. Write it.



Solving Problems on an Automobile Trip

Read each problem, which is about things that happened while Bob and his father were on a trip to California. Decide how you might solve each problem.

1. Bob said, "When we started this morning, our speedometer read 9497." Look at the picture and find out how far Bob and his father had driven.

2. Bob's father said that he planned to drive 425 miles the following day. What would the speedometer read then?

3. They drove the 357 miles between Omaha, Nebraska, and Julesburg, Colorado, in 7 hours. What was their average speed in miles per hour?

4. One day they drove 246 miles in 6 hours. How many miles an hour was that?

5. Father said that his car was going 19 miles on each gallon of gasoline. How far would 9 gallons of gasoline take them?

6. The 9 gallons of gasoline cost $.37 a gallon. What was the total cost?

7. At one station Bob's father bought 9 gallons of gasoline at 35¢ a gallon. How much did the gasoline cost?

8. At another station Bob's father paid $2.56 for 8 gallons of gasoline. What was the price for each gallon?

Oral Be ready to tell the equation you would use in solving each problem above and why you decided to use it.

Written Write the equation for each problem on this page. Solve it. Read the problem to see if your answer is sensible. Write the answer.

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. Hundreds can be divided in the same way as tens or ones. (191, 192)

2. When the digit in any place-value position in the dividend has a value less than that of the divisor, the form of the number that is the dividend must be changed. (193, 194)

3. When a number that stands for money is divided into equal groups, any remainder other than zero is expressed as cents. (198)

Questions to Discuss

1. Why are there 2 zeros in the quotient you get when you divide 800 by 2? (191)

2. Why is the quotient a three-digit number when you divide 820 by 4? When you divide 609 by 3? When you divide 728 by 7? (193)

3. Why is the quotient a two-digit number when you divide 160 by 4? When you divide 320 by 8? (194)

4. Why isn't the quotient written as dollars and cents when you divide $3.68 into groups containing $.06 each? (198)

5. What is the remainder when you divide $3.68 by $.06? (198)

6. Why is the quotient written as dollars and cents when you divide $1.95 by 5? (199)

Written Practice

Copy. Solve each equation.

	a	*b*	
1.	$800 \div 2 = n$	$600 \div 3 = n$	(191)
2.	$639 \div 3 = n$	$840 \div 4 = n$	(192)
3.	$904 \div 3 = n$	$618 \div 6 = n$	(193)
4.	$355 \div 7 = n$	$480 \div 6 = n$	(194)
5.	$428 \div 7 = n$	$127 \div 4 = n$	(195)

Copy. Write each quotient.

	a	*b*	
6.	$6\overline{)464}$	$8\overline{)952}$	(196, 197)
7.	$\$.08\overline{)\$4.79}$	$\$.05\overline{)\$3.95}$	(198)
8.	$3\overline{)\$5.70}$	$4\overline{)\$8.56}$	(199)

Solve each problem below.

9. Mr. Andersen paid $3.25 for 5 quarts of oil. What was the cost of each quart of oil? (199)

10. A class earned $3.80 selling tickets at $.05 each. How many tickets did the class sell? (198)

Self-Evaluation

Part 1 Copy. Write each sum, difference, or product.

	a	*b*	*c*	*d*
1.	5242 4310 6868 +7731	4231 7125 3876 +6745	7131 1484 3692 +2278	9219 1142 3531 +8664
2.	9876 −3259	7002 −6597	8405 −3928	6321 −4894
3.	6251 −3634	9786 −4879	8046 −5298	5992 −2007
4.	5732 ×4	4150 ×5	7431 ×7	9867 ×8
5.	38 ×46	95 ×37	87 ×68	46 ×75

Part 2 Copy. Write each quotient.

	a	*b*	*c*
1.	$3\overline{)927}$	$4\overline{)861}$	$7\overline{)549}$
2.	$5\overline{)8000}$	$3\overline{)9276}$	$6\overline{)5817}$

Part 3 Copy. Complete each statement below. The = sign is used to mean *is equivalent to*.

1. $\frac{1}{3}$ of 9 doz. = ___doz.

2. 1 ft. 6 in. = ___in.

3. $\frac{3}{4}$ of 12 in. = ___in.

4. 2 gal. 1 qt. = ___qt.

5. 1 hr. 10 min. = ___min.

6. 3 yd. 2 ft. = ___ft.

7. 2 wk. 2 da. = ___da.

Part 4 Write an equation for each problem below. Solve each equation. Write each answer.

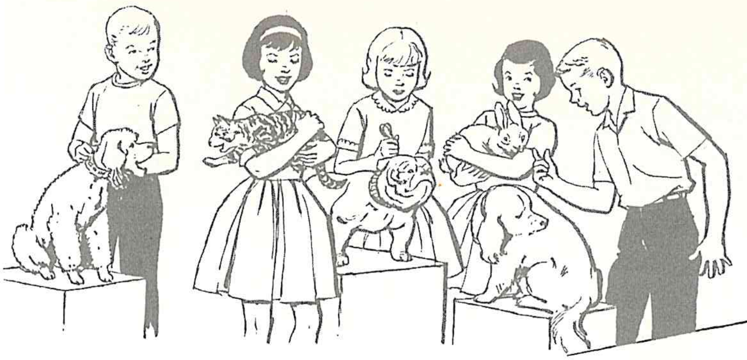
1. A grocer opened 6 boxes of canned peaches and put the cans of peaches on the shelf. There were 24 cans in each box. At noon 36 of the cans were left. How many had been sold?

2. Sue's mother bought 12 yards of cloth at 98¢ a yard, some thread for 25¢, and a pair of scissors for $4.50. How much did she spend?

3. A trucker wants to haul 545 bags of cement in 5 loads. How many bags must he haul in each load?

4. Robert bought a pound of candy for 60¢ and a pound of salted peanuts for 48¢. How much change should he get from $1.25?

5. A farmer sold 235 dozen eggs in September, 214 dozen in October, 198 dozen in November, and 121 dozen in December. What was the average number of dozens he sold each month?



12

Dividing Thousands in a Four-Digit Number

How many tickets are on all of the rolls? Jane plans to put the tickets into 4 boxes with the same number of tickets in each box. How many tickets will be in each box?

The tickets are to be arranged into groups of equal size. You are to find how many in each group; so you divide. The equation is $8000 \div 4 = n$.

Think of 8000 as 8 thousands. Then you can divide as shown.

$$\begin{array}{r} 2\text{ thousands} \\ 4\overline{)8\text{ thousands}} \end{array} \quad \text{or} \quad \begin{array}{r} 2000 \\ 4\overline{)8000} \\ \underline{8} \\ 000 \end{array}$$

There will be 2000 tickets in each box. Why is there a 0 in hundreds place, in tens place, and in ones place when you divide 8000 by 4?

You can divide the digits in thousands place as you divide the digits in hundreds, in tens, or in ones place.

Oral Read. Supply the missing numerals.

	a	*b*
1.	$200 \div 2 = n$	$2000 \div 2 = n$
2.	$400 \div 2 = n$	$4000 \div 2 = n$
3.	$603 \div 3 = n$	$6003 \div 3 = n$
4.	$n \times 400 = 800$	$n \times 4000 = 8000$
5.	$n \times 200 = 600$	$n \times 2000 = 6000$
6.	$n \times 300 = 900$	$n \times 3000 = 9000$

Written Copy, using the sign $\overline{)}$. Write each quotient. Check by multiplying the divisor by the quotient.

	a	*b*
1.	$4000 \div 4 = n$	$7000 \div 7 = n$
2.	$9000 \div 3 = n$	$4000 \div 2 = n$
3.	$6000 \div 2 = n$	$8000 \div 2 = n$
4.	$6000 \div 3 = n$	$8004 \div 4 = n$

Dividing Thousands, Hundreds, Tens, and Ones

Sometimes you need to solve an equation like 9639÷3=n. One way to solve it is shown below.

```
   3 Th|2 H|1 T|3 O
3)9 Th|6 H|3 T|9 O
  9 Th
  0 Th|6 H
      |6 H
      |0 H|3 T
      |   |3 T
      |   |0 T|9 O
      |   |   |9 O
      |   |   |0 O
```

The quotient is 3 thousands, 2 hundreds, 1 ten, and 3 ones, or 3213.

You do not need to write the words and symbols for thousands, hundreds, tens, and ones each time. Why not? Do you see that thousands are divided in the same way as hundreds, tens, or ones? How would you check the division shown at the right?

```
  3213
3)9639
  9
   6
   6
    3
    3
     9
     9
     0
```

MORE PRACTICE PAGE 313

In solving some equations there is a remainder of ones. How is the remainder usually written?

Oral Be ready to explain each division below.

a	*b*	*c*
$2\overline{)6842}$	$2\overline{)8483}$	$3\overline{)3908}$

Written Copy. Solve each equation.

	a	*b*
1.	6093÷3=n	n×3=6093
2.	6390÷3=n	n×3=6390
3.	4881÷2=n	8487÷4=n
4.	8809÷8=n	5009÷5=n
5.	9605÷3=n	8087÷2=n

A quick review

1. 9×(30+26+14)=n
2. 1500−(5×200)=n
3. (75+14+16+25)−40=n
4. 5×(18+12+10)=n
5. n×(30+20+10)=180
6. (48÷6)+n=60
7. (9×30)−n=190
8. 448−(3×16)=n
9. 1415+(3×12)=n
10. 6275−(75÷3)=n

Changing the Form of Thousands to Hundreds

A trucker hauled 2730 pounds of onions in 3 loads, each load having the same weight. How many pounds of onions did the trucker have on each load?

The set of 2730 is to be rearranged into 3 equal groups. You are to find how many pounds in each equal group; so you divide the numbers. The equation is $2730 \div n = 3$, which is solved by dividing 2730 by 3. You can think of 2730 as $2000+700+30+0$, or as 2 thousands, 7 hundreds, 3 tens, and 0 ones. Can you divide 2 in thousands place by 3? Why not? What do you think you should do with the 2 thousands?

The form of the 2 thousands must be changed to 20 hundreds, and the 20 hundreds added to the 7 hundreds. Then the equation can be solved as shown below.

$$\begin{array}{r|l|l} 9\text{ H} & 1\text{ T} & 0\ 0 \\ 3\overline{)27\text{ H}} & 3\text{ T} & 0\ 0 \\ \underline{27\text{ H}} & & \\ & 3\text{ T} & \\ & \underline{3\text{ T}} & \\ & & 0\ 0 \end{array}$$

The quotient is 9 hundreds, 1 ten, and 0 ones, or 910. Each load weighed 910 pounds.

The usual way to solve the equation for n is shown at the right. Why is 9 written in hundreds place of the quotient? Does $3 \times 910 = 2730$? Is the quotient correct?

$$\begin{array}{r} 910 \\ 3\overline{)2730} \\ \underline{27} \\ 3 \\ \underline{3} \\ 0 \end{array}$$

Oral Be ready to tell each quotient in the equations below.

	a	*b*
1.	$1648 \div 4 = n$	$5460 \div 6 = n$
2.	$7290 \div 9 = n$	$1807 \div 3 = n$

Written Copy, using the sign $\overline{)\quad}$. Write each quotient. Check by using multiplication.

	a	*b*
1.	$6309 \div 9 = n$	$4865 \div 6 = n$
2.	$5687 \div 8 = n$	$4907 \div 7 = n$
3.	$4084 \div 8 = n$	$4263 \div 6 = n$
4.	$5677 \div 7 = n$	$7296 \div 9 = n$
5.	$3665 \div 6 = n$	$6377 \div 7 = n$
6.	$6480 \div 8 = n$	$4500 \div 9 = n$
7.	$8108 \div 9 = n$	$4805 \div 6 = n$
8.	$4803 \div 8 = n$	$5466 \div 6 = n$
9.	$4550 \div 5 = n$	$5498 \div 9 = n$

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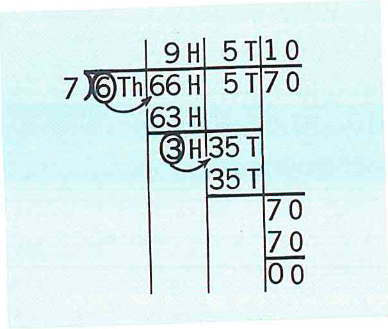
Changing the Form of Thousands and Hundreds in Division

The equation $6657 \div 7 = n$ can be solved for n as shown below.



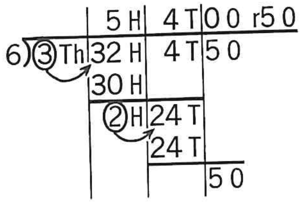
Why was the form of the 6 thousands changed to 60 hundreds? How was the form of the 3 hundreds changed?

In shorter form the equation is solved as shown. Can you divide 6 in thousands place by 7? Why is 9 written in hundreds place in the quotient? The quotient is 951.

$$\begin{array}{r} 951 \\ 7\overline{)6657} \\ 63 \\ \hline 35 \\ 35 \\ \hline 7 \\ 7 \\ \hline 0 \end{array}$$

MORE PRACTICE PAGE 313

Oral Be ready to tell how the equation below was solved.



Written Copy. Solve each equation.

	a	*b*
1.	$3363 \div 4 = n$	$(n \times 4) + 3 = 3363$
2.	$1142 \div 2 = n$	$n \times 2 = 1142$
3.	$3405 \div 5 = n$	$5207 \div 8 = n$
4.	$6517 \div 7 = n$	$6025 \div 7 = n$
5.	$2370 \div 3 = n$	$3921 \div 4 = n$

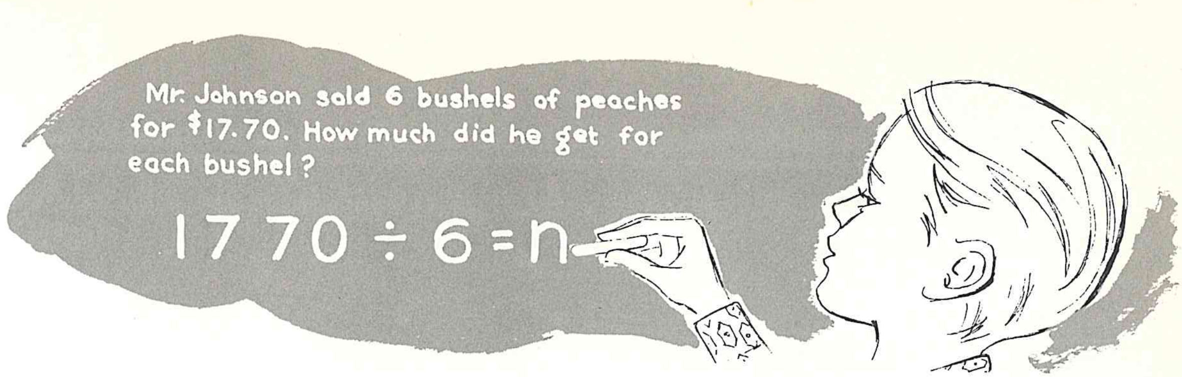
Each problem below is solved by using two operations. Decide upon the operations. Then write one equation for the whole problem. Place ( ) around the operation which must be done first. Solve each equation. Write the answer.

6. In each of 14 classrooms in a school there are 5 rows of seats with 6 seats in each row. How many seats are there in all 14 of the rooms?

7. Bob bought one book for \$.79 and another for \$1.19. How much change should he get from \$5.00?

8. Bob wanted a bicycle for \$49.50. He had \$41.75 in his bank and earned \$1.50 helping a neighbor. How much more money did he need to pay for the bicycle?

9. Ann had \$3.29. Her mother gave her \$5. Ann spent \$6.85 for shoes. How much did she have left?

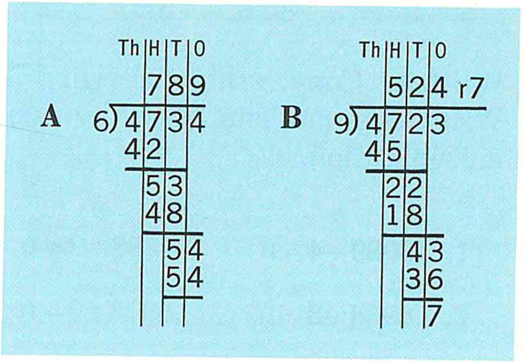


Mr. Johnson sold 6 bushels of peaches for $17.70. How much did he get for each bushel?

17 70 ÷ 6 = n

Changing the Form of Thousands, Hundreds, and Tens in Division

In the divisions below there are changes in form in each of the place-value positions. In each division, what change in form was made in thousands place? In hundreds place? In tens place?



Why is 7 written in hundreds place in the quotient of A? Where is 5 written in the quotient of B?

Oral What changes in the form of the dividend are needed in solving each equation below?

	a	*b*
1.	$7432 \div 8 = n$	$6529 \div 9 = n$
2.	$4357 \div 6 = n$	$5769 \div 7 = n$

Written Copy, using the sign $\overline{)\quad}$. Find each quotient. Check.

	a	*b*
1.	$7587 \div 9 = n$	$6675 \div 8 = n$
2.	$5125 \div 7 = n$	$6835 \div 9 = n$
3.	$4625 \div 5 = n$	$4928 \div 6 = n$
4.	$3714 \div 4 = n$	$2951 \div 7 = n$
5.	$5746 \div 9 = n$	$3861 \div 6 = n$

Write an equation for each problem below. Solve the equation. Read the problem to see if your answer is sensible. Write your answer.

6. The Tastee Bakery can bake at least 9600 rolls an hour. These will be packed with 6 rolls in each box. At least how many boxes are filled each hour?

7. A nursery man has 1845 pine-tree seedlings to plant in 9 beds. How many seedlings will be in each bed, if he plants the same number in each one?

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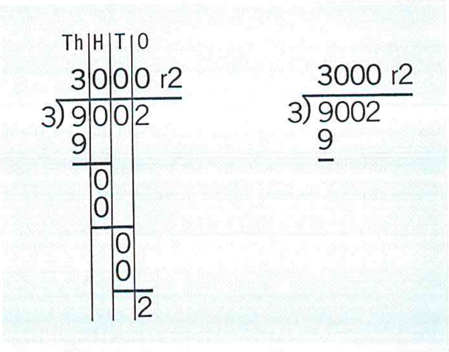
Practicing Division

You should now be able to solve any equation in which you divide a four-digit number by a one-digit number. When you do, be especially careful to write 0's in the quotient when they are needed.

The equation $9002 \div 3 = n$ has three zeros in the quotient. Why? The division has been worked out in the grid and in the short form below.



The remainder, 2, is less than the divisor; so the division is complete.

In every division that you do, you are not finished until you end with a remainder. This remainder may be 0, or it may be any whole number that is less than the divisor.

The possible remainders for a division by 2 are 0 and 1. What is the largest possible remainder for each of the following divisors: 4, 5, 9, 8, 7, 6, 1, 3?

Oral Tell how to solve and how to check each equation below.

	a	*b*
1.	$6000 \div 2 = n$	$4003 \div 2 = n$
2.	$8246 \div 2 = n$	$2739 \div 9 = n$
3.	$n \times 2000 = 6000$	$n \times 3000 = 6000$

Tell the remainder for each of the following divisions.

	a	*b*	*c*	*d*
4.	$8 \div 1$	$8 \div 2$	$8 \div 3$	$8 \div 4$
5.	$8 \div 5$	$8 \div 6$	$8 \div 7$	$8 \div 8$

Written Copy, using the sign $\overline{)\quad}$. Write each quotient. Check by using multiplication.

	a	*b*
1.	$8089 \div 4 = n$	$1898 \div 9 = n$
2.	$6904 \div 8 = n$	$6814 \div 2 = n$
3.	$1004 \div 5 = n$	$5468 \div 6 = n$
4.	$4079 \div 6 = n$	$8003 \div 4 = n$
5.	$5549 \div 5 = n$	$9784 \div 7 = n$
6.	$2106 \div 3 = n$	$3690 \div 4 = n$
7.	$1738 \div 2 = n$	$6900 \div 3 = n$
8.	$8364 \div 4 = n$	$8961 \div 3 = n$
9.	$2805 \div 3 = n$	$7391 \div 8 = n$

Dividing Numbers That Stand for Money

Sometimes you are to find the amount of money in each group of equal size as in problems like this: Mr. Adams sold 4 bushels of apples for $11.80. He received the same amount of money for each bushel. How much did he get for each bushel?

The equation is 1180÷n=4, which is solved by dividing 1180 by 4. To help you remember that you are working with numbers that stand for money, you may divide as shown. The value of n is 295. The answer is $2.95.

$$\begin{array}{r} \$\ 2.95 \\ 4\overline{)\$11.80} \\ 8 \\ \hline 3\,8 \\ 3\,6 \\ \hline 20 \\ 20 \\ \hline \end{array}$$

Sometimes you are to find how many equal groups, as in problems like this: A class earned $10.35 selling tickets at $.05 each. How many tickets did the class sell? (Here is a hint: Think of $10.35 and $.05 as all in cents.)

The equation is 1035÷5=n. In solving it, you may use the signs $ and . as you divide, as shown. The value of n is 207. The answer to the problem is 207 tickets.

$$\begin{array}{r} 2\ 07 \\ \$.05\overline{)\$10.35} \\ 10 \\ \hline 35 \\ 35 \\ \hline \end{array}$$

Oral Answer these questions.

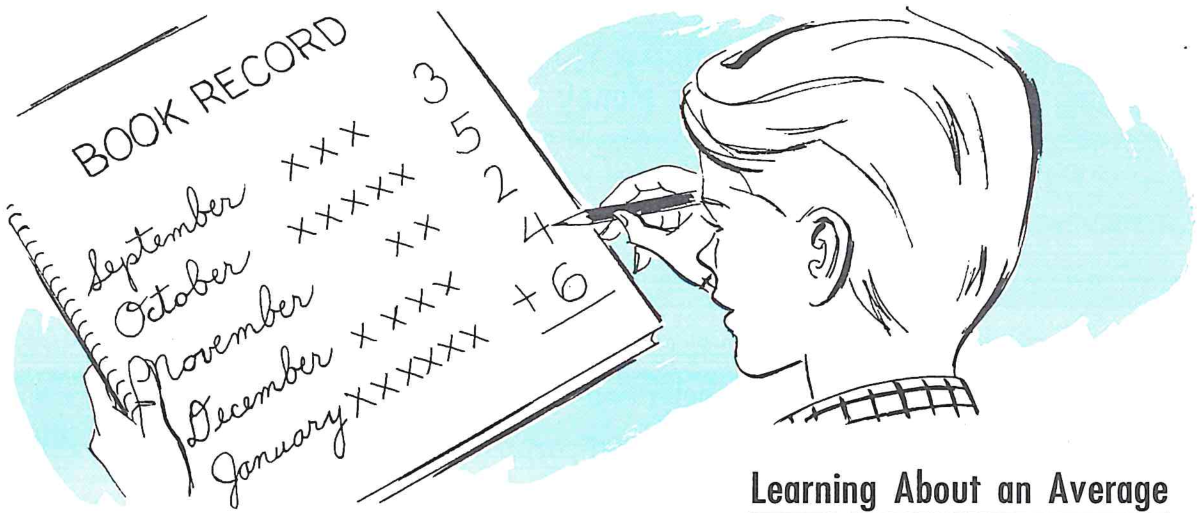
1. Why is the answer to the first problem written as dollars and cents?

2. How can you tell when you are to use the signs $ and . in the quotient?

Written Copy. Write each quotient. Check by multiplying.

	a	*b*
1.	$6\overline{)\$20.40}$	$9\overline{)\$39.23}$
2.	$4\overline{)\$79.75}$	$3\overline{)\$86.90}$
3.	$6\overline{)\$94.50}$	$5\overline{)\$31.60}$
4.	$3\overline{)\$89.52}$	$6\overline{)\$79.26}$
5.	$3\overline{)\$19.62}$	$3\overline{)\$15.95}$
6.	$4\overline{)\$84.48}$	$4\overline{)\$86.49}$
7.	$7\overline{)\$92.06}$	$7\overline{)\$90.23}$
8.	$8\overline{)\$74.56}$	$8\overline{)\$66.80}$

Something to do Write 5 equations of your own using division. Then make up 5 problems to fit these equations, and solve the problems. In at least two of the problems, use division of a number that stands for money.



Learning About an Average

Bob kept a record of the books he read each month. His book record is shown in the picture.

As Bob looked at his record, he said, "I wonder how many books, on the average, I read each month."

In arithmetic, an **average** is the number you get when you divide the sum of the numbers of all of the sets by the number of sets.

Look at Bob's record of books read. How many books did he read in each month? For how many months did he keep his book record? After answering the above questions, write this statement:

$$\text{Average} = \frac{3+5+2+4+6}{5}$$

$$\text{Average} = \frac{20}{5} \text{ or } 20 \div 5$$

$$\text{Average} = 4$$

On the average, Bob read 4 books each month.

The chart below shows, to the nearest inch, the rainfall in 4 different months.

Month	Inches
May	3
June	5
July	4
August	2

What was the average rainfall?

Again, think of the meaning of average as shown below.

$$\text{Average} = \frac{3+5+4+2}{4}$$

$$\text{Average} = \frac{14}{4} \text{ or } 14 \div 4$$

$$\text{Average} = 3\tfrac{1}{2}$$

Here is the equation you would use in solving the problem: $(3+5+4+2) \div 4 = n$. What is the value of n?

The average rainfall in each month was $3\frac{1}{2}$ inches.

Oral Answer these questions.

1. Why did you first need to know the amount of rainfall in all of the months?

2. Why was the amount of rainfall divided by 4?

3. Why was the answer given as $3\frac{1}{2}$ inches instead of 3 inches, remainder 2 inches?

Change each of the following problems into an equation. Be ready to tell the answer.

4. Jim sold 8 tickets, Bob sold 4, Ronald sold 7, and David sold 5. What was the average number of tickets sold by the boys?

5. Dick's brother drove 42 miles the first hour, 39 miles the next hour, and 48 miles the third hour. On the average, how far did he drive in each hour?

Written Write an equation for each problem below. Solve the equation. Read the problem again to see if your answer is sensible. Then write the answer.

1. In one school there were 17 girls in grade 1, 15 girls in grade 2, 19 girls in grade 3, and 19 girls in grade 4. What was the average number of girls in each of the four grades?

2. There were 64 boys in 4 different grades. What was the average number of boys in each grade?

3. In four games Bob's team made 11 runs, 7 runs, 9 runs, and 0 runs. What was the average number of runs in each game?

4. Sally read 35 pages of her book on Saturday, 27 pages on Sunday, 19 pages on Monday, 0 pages on Tuesday, and 30 pages on Wednesday. On the average, how many pages did she read each day?

5. Mr. Thompson drove 325 miles in 8 hours. On the average, how far did he drive in each hour?

6. In seven days, Gerry gathered 19, 21, 32, 18, 17, 21, and 20 eggs. What was the average number of eggs gathered on each day?

7. The temperature was 77° on Monday, 82° on Tuesday, and 81° on Wednesday. What was the average temperature for each day?

Find the average of each set of numbers below.

8. 3, 5, 7

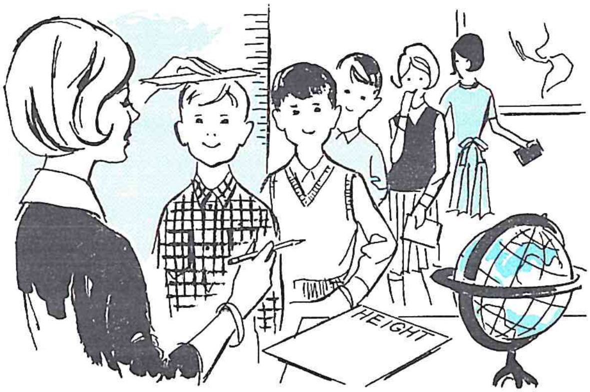
9. 6, 9, 8, 9

10. 22, 23, 13, 30

11. 24, 16, 18, 22

12. 36, 21, 15, 28

Solving Problems About Averages



Read each problem. What equation would you use in solving it?

1. Ben's father drove 312 miles on Sunday, 295 miles on Monday, 212 miles on Tuesday, and 356 miles on Wednesday. What was the average number of miles driven each day?

2. On the five days of one week Alice spent 20¢, 27¢, 23¢, 25¢, and 30¢ for school lunches. What was the average amount she spent for lunch each day?

3. In five days a farmer gathered 110 eggs, 115 eggs, 117 eggs, 105 eggs, and 103 eggs. What was the average number of eggs he gathered each day?

4. In one school in Lakeville, there were 320 children. There were 285 in another school, and 349 in a third. What was the average number of children in each school?

5. Robert earned money by helping at his father's store. He earned $3.05 one week, $2.75 the next week, and $3.80 the third week. What were his average earnings each week?

6. Bill weighs 75 pounds, Jim weighs 73 pounds, Susan weighs 69 pounds, Jane weighs 87 pounds, and Helen weighs 66 pounds. What is their average weight?

7. Ray is 58 inches tall, Judy is 56 inches, Dick is 60 inches, Ruth is 54 inches, and Ken is 57 inches. What is their average height?

Oral Be ready to tell the equation you decided upon for each problem above and why you decided upon it.

Written Write an equation for each of the above problems. Solve it. Write the answer for each problem after you reread the problem to see if your answer is sensible.

Can you do this? Each dot in the divisions below represents a missing numeral. Complete each division, writing the correct numerals in each one.

a

$$\begin{array}{r} \bullet\bullet \\ 8\overline{)\bullet1\bullet} \\ \underline{\bullet\bullet} \\ 5\bullet \\ \underline{\bullet\bullet} \\ 0 \end{array}$$

b

$$\begin{array}{r} \bullet\bullet\bullet \\ 9\overline{)\bullet7\bullet\bullet} \\ \underline{\bullet\bullet} \\ \bullet\bullet \\ \underline{\bullet4} \\ 0 \end{array}$$

Practicing Problem Solving

Read each problem below. Think what you might do with the sets in each problem. Write an equation for each problem and solve it. Write the answer.

1. Mary bought 3 books that cost \$1.98 each. How much did they cost?

2. A class treasurer had \$8.95 in the treasury. He collected \$1.25 in dues. Then he bought a notebook for \$.49. How much money was left?

3. Ann spent \$2.19 for meat, \$.35 for rolls, and \$.85 for coffee. How much change did she get from \$5.00?

4. Five boys agreed to share equally the cost of a party. They had spent \$3.15. What was each boy's share of the cost?

5. Bob needs \$4.75 to buy a mitt. His mother gave him \$1.50 and he had \$2.98. How much more money did he need?

6. An ice cream man collected \$9.95 selling ice cream bars and \$4.75 selling popsicles. How much money did he collect?

7. Jack's father, his uncle, and Mr. Judson drove to a lake 528 miles away to go fishing. They agreed to take turns driving. If each man drove a third of the distance, how many miles did each one drive?

8. A truck driver drove for 8 hours at an average speed of 37 miles an hour. How far did he drive?

9. Mrs. Adams earned \$328 in 4 weeks. How much did she earn in 10 weeks, if her pay was the same for each week?

10. A truck weighing 7450 pounds was loaded with a ton of coal. How many pounds did the truck and its load weigh altogether?

11. Earl, Sally, and Ted helped their father pick tomatoes. Earl picked 3 pecks, Sally picked 2 pecks, and Ted picked 4 pecks. Altogether, 17 peck measures were filled. How many pecks of tomatoes did the children's father pick?

12. At 6 a.m. the temperature was 68°. It was 92° at noon and dropped to 89° by 6 p.m. What was the average temperature for the day?

13. Bruce, Ken, Mary, and Louise each ordered a sandwich at 15¢ and a glass of milk at 10¢. How much did their lunch cost? (Use the signs \$ and . in your answer.)

14. Mrs. Ray bought Kathy a coat at a sale. The sale price was $\frac{1}{3}$ less than the original price of \$49.65. How much did Mrs. Ray pay for Kathy's new coat?

Practicing Addition, Subtraction, Multiplication, and Division

You should not need any help with this page.

Part 1 Copy. Write each sum. Check by adding another way.

	a	*b*	*c*
1.	5458 7690 +2703	3298 8377 +5412	\$54.77 61.96 +32.78
2.	7636 4215 1067 +2899	9855 3024 2156 +6707	\$21.94 18.33 65.45 +98.27
3.	4373 2642 9801 +7435	6532 9054 4392 +1708	\$87.15 28.61 10.29 +94.03
4.	2910 7078 3884 +5569	1809 6980 4737 +5062	\$36.87 57.90 43.56 +72.61

Part 2 Copy. Write each product and quotient. Check.

	a	*b*	*c*
1.	$6\overline{)404}$	$7\overline{)535}$	$5\overline{)\$3.97}$
2.	$3\overline{)286}$	$9\overline{)821}$	$\$.04\overline{)\$7.29}$
3.	60 ×22	52 ×95	\$.48 ×67
4.	57 ×38	41 ×76	\$.93 ×62

Part 3 Solve each equation below.

1. $4758-(375+486)=n$

2. $9186-(425+382)=n$

3. $5272-(155+713)=n$

4. $7640-(294+171)=n$

5. $1599-(246+825)=n$

6. $3833-(933+984)=n$

7. $6467-(387+660)=n$

8. $9021-(812+236)=n$

9. $8905-(608+150)=n$

10. $2314-(561+254)=n$

11. $6913-(762+109)=n$

12. $3079-(432+868)=n$

Part 4 Solve each equation below.

	a	*b*
1.	$(9\times35)\div5=n$	$(9\times87)\div7=n$
2.	$(8\times47)\div3=n$	$(6\times45)\div5=n$
3.	$(9\times54)\div6=n$	$(7\times28)\div3=n$
4.	$(8\times52)\div4=n$	$(8\times39)\div6=n$
5.	$(7\times63)\div8=n$	$(9\times63)\div8=n$
6.	$(6\times99)\div9=n$	$(4\times76)\div8=n$
7.	$(4\times48)\div6=n$	$(5\times49)\div7=n$

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. The thousands of the quotient are written above the thousands of the dividend. (205)

2. When the digit in thousands place is less than the divisor in any division, all of the thousands are changed to hundreds and added to the hundreds. (207)

3. Each division is completed when the final remainder is 0 or some other number at least 1 less than the divisor. (210)

4. An average is the number you find when you add the numbers telling how many in each group and divide your sum by the number of addends. (212)

Words to Know

Average (212)

Questions to Discuss

1. In dividing, why is it very important to write each digit of the quotient in the proper place-value position? (205, 210)

2. When might you want to find the average of several numbers? (212)

3. How would you find the average of 3, 5, 7, 9, and 3? (212)

4. In dividing numbers that stand for money, why is it a good idea to use the signs $ and . in the dividend? (211, 212)

5. How can you decide whether to add, subtract, multiply, or divide to solve a problem? (215)

Written Practice

Solve each equation.

	a	*b*	
1.	$9000 \div 3 = n$	$8002 \div 4 = n$	(205)
2.	$6907 \div 3 = n$	$n \times 3 = 9609$	(206)
3.	$3600 \div 9 = n$	$4802 \div 8 = n$	(207)
4.	$6516 \div 7 = n$	$2370 \div 3 = n$	(208)
5.	$3715 \div 4 = n$	$2953 \div 7 = n$	(209)

Solve each problem.

6. Tom walked $\frac{1}{4}$ mile each day. How far did he walk in 5 days? Express the distance in feet. (212)

7. Sue's spelling scores for 4 days were 85, 98, 76, and 91. What was her average score for the 4 days? (212)

8. Alan walked 4 miles in 2 hours. What was the average number of miles he walked each hour? (212)

Self-Evaluation

Part 1 Solve each equation.

1. $275+486+219+485=n$

2. $1457+3581+6693+2702=n$

3. $4827+6169+5035+7948=n$

4. $n=2615+5947+3836+4728$

5. $n=3152+6373+4481+5269$

Part 2 Solve each equation.

	a	*b*
1.	$8197-4369=n$	$5050-3732=n$
2.	$4113-2658=n$	$7211-2318=n$
3.	$6125-4186=n$	$9406-7641=n$
4.	$n=2647-1207$	$n=5398-4530$
5.	$n=4739-3795$	$n=3580-1429$
6.	$n=9126-5764$	$n=7093-1858$

Part 3 Solve each equation.

	a	*b*
1.	$3\times652=n$	$4\times509=n$
2.	$7\times785=n$	$6\times316=n$
3.	$5\times149=n$	$8\times818=n$
4.	$n=2\times974$	$n=1\times930$
5.	$263\times n=1052$	$n\times9=3843$
6.	$n=7\times843$	$n=6\times479$

Part 4 Solve each equation.

	a	*b*
1.	$1298\div6=n$	$3545\div5=n$
2.	$8972\div3=n$	$1601\div4=n$
3.	$4816\div7=n$	$6083\div2=n$
4.	$n\div3=3153$	$n=7130\div9$
5.	$n=2327\div8$	$n=5763\div4$

Part 5 Solve each equation.

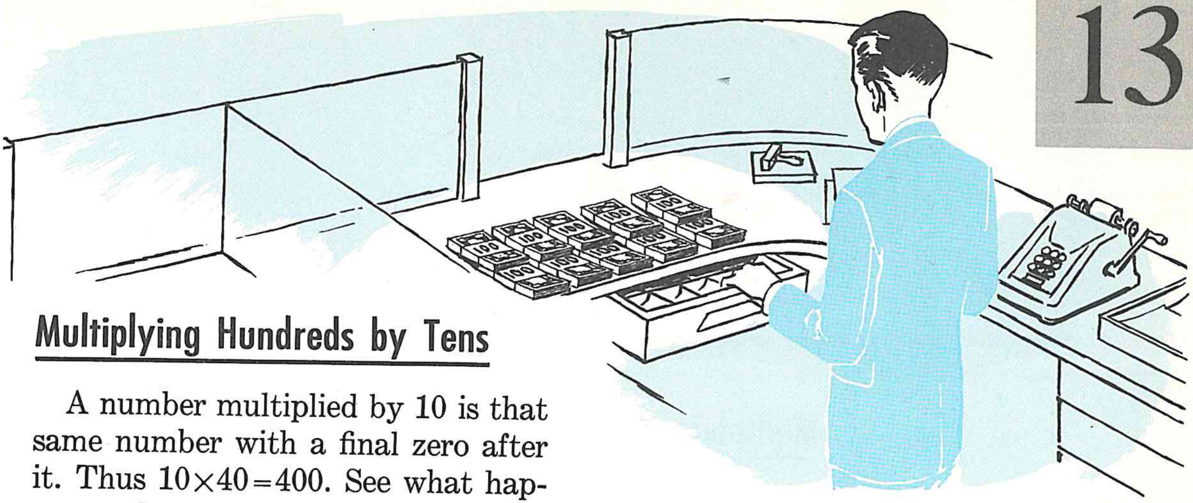
	a	*b*
1.	$n+750=1000$	$365+n=425$
2.	$n+288=900$	$n-250=150$
3.	$435+n=700$	$48\div n=6$
4.	$n\div8=8$	$n\times6=42$
5.	$9\times n=360$	$n\times30=180$
6.	$n=8\times800$	$n\times9=7698$

Part 6 Solve these problems.

1. In five days a farmer gathered 117 eggs, 105 eggs, 103 eggs, 110 eggs, and 115 eggs. What was the average number of eggs he gathered each day?

2. Lola is 57 inches tall, Ann is 58 inches, Jack is 60 inches, Bruce is 58 inches, and Alice is 54 inches. What is their average height?

13



Multiplying Hundreds by Tens

A number multiplied by 10 is that same number with a final zero after it. Thus 10×40=400. See what happens when you multiply hundreds by 10, or 1 T.

$10\times\boxed{100}\overset{\curvearrowright}{=}\boxed{100}0$ 1 T×1 H=1 Th

$10\times\boxed{200}\overset{\curvearrowright}{=}\boxed{200}0$ 1 T×2 H=2 Th

$10\times\boxed{300}\overset{\curvearrowright}{=}\boxed{300}0$ 1 T×3 H=3 Th

$10\times\boxed{400}\overset{\curvearrowright}{=}\boxed{400}0$ 1 T×4 H=4 Th

Does each product have one more zero than each multiplicand?

What product would you expect if you multiplied 500 by 10? 700 by 10? 900 by 10? Do hundreds multiplied by 10 equal thousands?

Suppose you are to multiply hundreds by 20. See what happens.

$20\times\boxed{100}\overset{\curvearrowright}{=}\boxed{200}0$ 2 T×1 H=2 Th

$20\times\boxed{200}\overset{\curvearrowright}{=}\boxed{400}0$ 2 T×2 H=4 Th

$20\times\boxed{300}\overset{\curvearrowright}{=}\boxed{600}0$ 2 T×3 H=6 Th

$20\times\boxed{400}\overset{\curvearrowright}{=}\boxed{800}0$ 2 T×4 H=8 Th

When you multiply by 20, the products are twice as great as when you multiply by 10. How many zeros do you affix to the name of a number when you multiply it by 20? By 30? By 40? By 50?

You cannot write 10, 12, or any other two-digit numeral in thousands place. You write 10 Th as 10,000, which is 1 ten-thousand. You write 12 Th as 12,000, which is 1 ten-thousand and 2 thousands.

Oral Read. Replace each letter p with the product.

	a	*b*
1.	10×600=p	10×700=p
2.	20×500=p	20×600=p

Tell the number word you would use in completing each statement below.

3. 2 T×7 H=__Th

4. 3 T×5 H=__Th

	144	
	X15	
5 x 4 =	20	1st partial product
5 x 40 =	200	2nd partial product
5 x 100 =	500	3rd partial product
10 x 4 =	40	4th partial product
10 x 40 =	400	5th partial product
10 x 100 =	1000	6th partial product
Add	2160	product

Multiplying Three-Digit Numbers by Tens and Ones

A buyer for a supermarket bought 15 cases of eggs. Each case held 12 dozen, or 144 eggs. How many eggs did he buy?

Suppose the buyer had bought 5 cases from one farmer and 10 cases from another. You could find how many eggs he had bought by multiplying 144 by 5 and 144 by 10 and then adding the products. The work is done for you below.

$$\begin{array}{r} 144 \\ \times 5 \\ \hline 720 \end{array} \qquad \begin{array}{r} 144 \\ \times 10 \\ \hline 1440 \end{array} \qquad \begin{array}{r} 720 \\ +1440 \\ \hline 2160 \end{array}$$

A faster way to solve the problem is to write it as an equation, like this: $15 \times 144 = n$. You can multiply 144 by 15 as shown below.

	144	
	×15	
5×144=	720	1st partial product
10×144=	1440	2nd partial product
Add	2160	product

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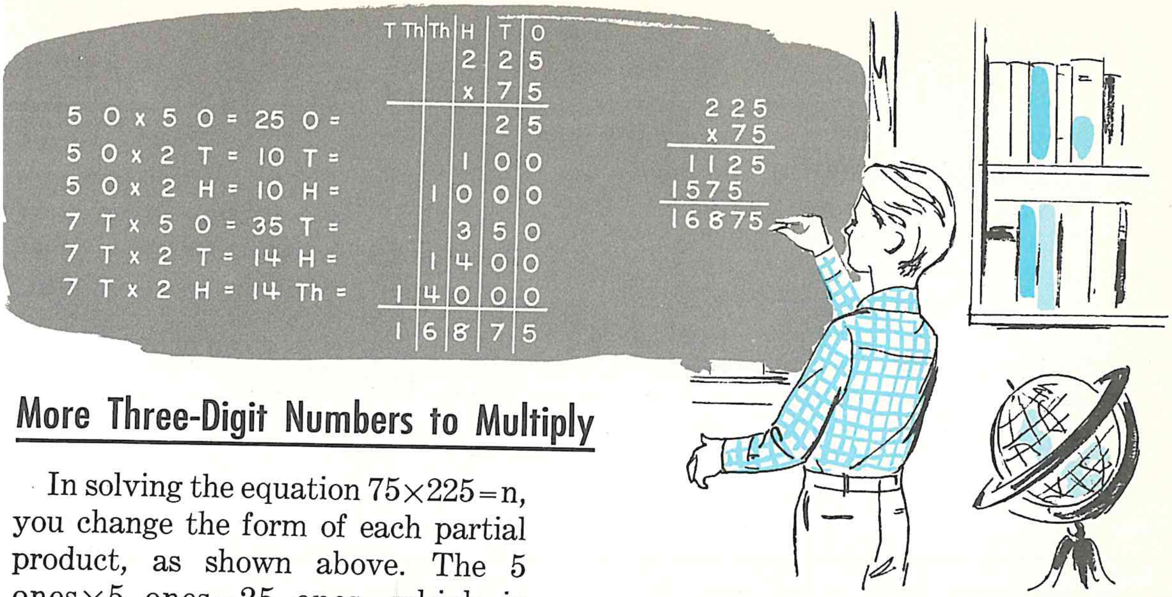
Why is it unnecessary to write the 0 in ones place of the second partial product?

Oral Solve each equation below.

	a	b
1.	$3 \times 150 = n$	$10 \times 150 = n$
2.	$6 \times 110 = n$	$10 \times 110 = n$
3.	$2 \times 224 = n$	$10 \times 224 = n$
4.	$5 \times 111 = n$	$10 \times 111 = n$
5.	$4 \times 222 = n$	$10 \times 222 = n$

Written Copy. Write each partial product and product.

	a	b	c	d
1.	150 ×13	110 ×60	224 ×12	111 ×15
2.	342 ×12	123 ×31	748 ×11	324 ×12
3.	237 ×22	345 ×21	419 ×22	217 ×33



More Three-Digit Numbers to Multiply

In solving the equation $75 \times 225 = n$, you change the form of each partial product, as shown above. The 5 ones × 5 ones = 25 ones, which is changed to 2 tens and 5 ones.

In the longer way you can see where each change in form was made. In the shorter way only two partial products are written.

What is the first partial product? The second partial product?

Oral Answer each question below.

1. What steps do you take when you multiply 225 by 5 ones? When you multiply 225 by 7 tens?

2. Why is the first digit of the second partial product written in tens place?

Written Copy. Write each product.

	a	*b*	*c*	*d*
1.	324 ×21	420 ×12	218 ×32	165 ×43
2.	413 ×54	731 ×96	258 ×23	814 ×67
3.	648 ×35	182 ×35	695 ×58	103 ×75
4.	304 ×28	705 ×89	541 ×51	793 ×64
5.	619 ×48	491 ×73	390 ×67	823 ×39

Solve these problems.

6. The children of our school went to a fair in 13 buses. Each bus could take 42 children. How many children went on all the buses?

7. To each of 23 classrooms 48 notices were sent to announce the PTA concert. How many PTA notices were sent out altogether?

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Using a Short Way to Multiply

Two ways of solving the equation $60 \times 824 = n$ are shown below.

$$\begin{array}{r} 824 \\ \times 60 \\ \hline 000 \\ 4944 \\ \hline 49440 \end{array} \qquad\qquad \begin{array}{r} 824 \\ \times 60 \\ \hline 49440 \end{array}$$

In the shorter way, multiply by 6 and affix a zero to that product. Multiplying by 60 gives a product ten times greater than multiplying by 6, because $60 = 10 \times 6$.

Oral Read the following equations. Replace each n with the missing number word.

	a	*b*
1.	$30 \times 123 = n$	$30 \times 230 = n$
2.	$50 \times 600 = n$	$80 \times 900 = n$

Written Copy. Write each partial product and product.

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	a	*b*	*c*	*d*
1.	$\begin{array}{r} 465 \\ \times 78 \\ \hline \end{array}$	$\begin{array}{r} 987 \\ \times 88 \\ \hline \end{array}$	$\begin{array}{r} 654 \\ \times 35 \\ \hline \end{array}$	$\begin{array}{r} 922 \\ \times 65 \\ \hline \end{array}$
2.	$\begin{array}{r} 869 \\ \times 75 \\ \hline \end{array}$	$\begin{array}{r} 725 \\ \times 73 \\ \hline \end{array}$	$\begin{array}{r} 549 \\ \times 46 \\ \hline \end{array}$	$\begin{array}{r} 985 \\ \times 59 \\ \hline \end{array}$
3.	$\begin{array}{r} 986 \\ \times 83 \\ \hline \end{array}$	$\begin{array}{r} 609 \\ \times 67 \\ \hline \end{array}$	$\begin{array}{r} 514 \\ \times 15 \\ \hline \end{array}$	$\begin{array}{r} 420 \\ \times 31 \\ \hline \end{array}$

Solve each problem below.

4. Mrs. Olsen bought 24 yards of material for drapes. At $2.25 a yard, how much did all the material cost?

5. A quarter of a ton of coal weighs 500 lb. How much does $\frac{3}{4}$ T. weigh?

6. Mrs. Jones promised to make lemonade for the class picnic. If each of the 27 children drinks a pint of lemonade, how many quarts should Mrs. Jones make?

7. Mr. Green used 97 gallons of gas one month. If his car travels 18 miles on a gallon, how many miles did he drive that month?

8. Phil's brother earns $6.00 a week for after-school work. If he puts $\frac{3}{4}$ of it in the bank, how much does he save each week?

Can you do this? Each dot in the multiplications below stands for a missing numeral. Can you supply the correct numerals in each one and complete each problem?

	a	*b*
1.	$\begin{array}{r} \bullet 9 \\ \times \bullet \\ \hline \bullet 53 \end{array}$	$\begin{array}{r} \bullet\bullet \\ \times 9 \\ \hline 1\bullet 3 \end{array}$
2.	$\begin{array}{r} \bullet\bullet \\ \times 3 \\ \hline \bullet 08 \end{array}$	$\begin{array}{r} 6\bullet \\ \times 3 \\ \hline \bullet\bullet 2 \end{array}$

Solving Problems

Read carefully each problem below. Think about the situation and what you could do with the sets to find each answer. Then answer the following questions about each problem:

1. Would I combine sets? (If so, I would either add or multiply the numbers.)

2. Would I separate a total amount into parts? (If so, I would subtract or divide the numbers.)

3. Would I compare sets to see by how many one set is greater than the other? (If so, I would subtract the numbers.)

Written Write an equation for each problem below. Then solve each problem. Read the problem again to see if your answer is sensible. Write the answer.

1. Sally has a savings account. If she saves $1.25 each week, how much can she save in a year?

2. Martha bought a pair of shoes for $9.89 and a new jacket for $19.25. How much did she spend?

3. Bob's dad earned $97.50 one week and $79.50 the next week. How much money did he earn in the two weeks?

4. Mr. Adams filled 24 grain bags with wheat. He put 2 bushels of wheat in each bag. If each bushel weighed 60 pounds, how much wheat was in all of the bags?

5. Mr. Johnson sold 25 bushels of peaches at $3.98 a bushel. How much money did he get for his peaches?

6. Dick collected $1.75 from 5 pupils. He collected the same amount from each one. How much did each pupil give Dick as class dues?

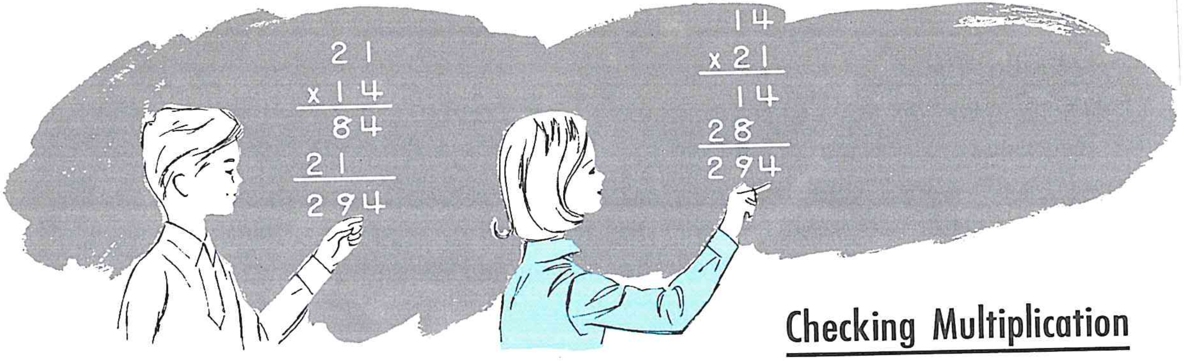
7. James planned to put 5 pounds of apples into each bag. He began with 2 baskets of apples, each weighing 44 pounds. How many bags could he fill, and how many pounds would be left?

8. Mr. Anderson paid $2415 for 7 acres of land. What was the cost of each acre of land?

9. Ann can earn 50¢ an hour as a baby sitter. She worked 2 hours a day for 6 days. How much did she earn?

10. Dick had $3.19 in his bank. His uncle put a quarter into the bank and Dick put 75¢ into it. How much money was then in his bank?

11. Joe took 3 five-pound sacks of sugar from a box holding 90 pounds. How many pounds of sugar were left?



Checking Multiplication

You do not change the product when you change the order of the numbers you are multiplying.

Thus 8×9=72 and 9×8=72.

Does 8×9=9×8?

A good way to check multiplication is to change the order of the multiplier and the multiplicand and multiply again. You should get the same product each time. Observe the multiplications below.

$$\begin{array}{r} 39 \\ \times 25 \\ \hline 195 \\ 78 \\ \hline 975 \end{array} \qquad\qquad \begin{array}{r} 25 \\ \times 39 \\ \hline 225 \\ 75 \\ \hline 975 \end{array}$$

Oral Answer these questions.

1. Which multiplication facts did you use in multiplying 39 by 25? In multiplying 25 by 39?

2. Does the equation 25×39=n have the same meaning as the equation 39×25=n?

3. Why is it a better check to change the order of the multiplier and the multiplicand than merely to multiply again the same way?

Written Copy. Solve each equation.

	a	*b*
1.	24×94=n	94×24=n
2.	47×43=n	43×47=n
3.	59×25=n	25×59=n
4.	27×62=n	62×27=n
5.	24×83=n	83×24=n

Copy. Write each partial product and product. Check by changing the order of the multiplier and multiplicand and multiplying a second time.

	a	*b*	*c*	*d*
6.	$\begin{array}{r} 82 \\ \times 25 \\ \hline \end{array}$	$\begin{array}{r} 63 \\ \times 38 \\ \hline \end{array}$	$\begin{array}{r} 62 \\ \times 35 \\ \hline \end{array}$	$\begin{array}{r} 92 \\ \times 39 \\ \hline \end{array}$
7.	$\begin{array}{r} 83 \\ \times 29 \\ \hline \end{array}$	$\begin{array}{r} 62 \\ \times 36 \\ \hline \end{array}$	$\begin{array}{r} 72 \\ \times 46 \\ \hline \end{array}$	$\begin{array}{r} 63 \\ \times 37 \\ \hline \end{array}$
8.	$\begin{array}{r} 22 \\ \times 65 \\ \hline \end{array}$	$\begin{array}{r} 32 \\ \times 59 \\ \hline \end{array}$	$\begin{array}{r} 88 \\ \times 53 \\ \hline \end{array}$	$\begin{array}{r} 57 \\ \times 49 \\ \hline \end{array}$

Multiplying Ones by Hundreds

See what happens when you multiply ones by 1, by 10, and by 100.

$1\times1=1$ $10\times1=10$ $100\times1=100$
$1\times2=2$ $10\times2=20$ $100\times2=200$
$1\times3=3$ $10\times3=30$ $100\times3=300$
$1\times4=4$ $10\times4=40$ $100\times4=400$
$1\times5=5$ $10\times5=50$ $100\times5=500$

What product would you expect if you multiplied 6 by 100? 7 by 100? 8 by 100? 9 by 100?

Do you see that ones multiplied by 100 equal hundreds? When you name a number that you multiplied by 100, could you simply name the number and affix 2 zeros?

Now see what happens when you multiply ones by 2, by 20, and by 200.

$2\times1=2$ $20\times1=20$ $200\times1=200$
$2\times2=4$ $20\times2=40$ $200\times2=400$
$2\times3=6$ $20\times3=60$ $200\times3=600$
$2\times4=8$ $20\times4=80$ $200\times4=800$
$2\times5=10$ $20\times5=100$ $200\times5=1000$

How many zeros are affixed after each product in column 3 above?

To multiply a number by 200, multiply the number by 2 and affix 2 zeros. How would you multiply a number by 300? By 500? By 700? By 800? By 900? In each case, how many zeros do you affix to the product?

Oral Read. Replace n with the missing number word.

1. $500\times8=n$ $500\times9=n$
2. $600\times4=n$ $700\times5=n$
3. $800\times8=n$ $900\times9=n$

Tell the number word you would use to complete each statement below.

4. 7 H×8 O= __ H or __
5. 8 H×5 O= __ H or __
6. 9 H×7 O= __ H or __

Written Write each equation in 1 through 3 above. Solve each equation. Then complete statements 4 through 6.

Can you do this?

	a	*b*
1.	$9\times7=n$	$9\times n=63$
2.	$n\times9=63$	$63\div9=n$
3.	$63\div n=9$	$n\times7=63$
4.	$3\times(12+16)=n$	$n\times(6+5)=44$
5.	$4\times(6+n)=40$	$3\times(5+n)=24$

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Multiplying Tens or Hundreds by Hundreds

See what happens when you multiply tens by 100.

$100\times10=1000$ $\quad$ $100\times40=4000$

$100\times20=2000$ $\quad$ $100\times50=5000$

$100\times30=3000$ $\quad$ $100\times60=6000$

What product would you expect if you multiplied 70 by 100? 80 by 100? 90 by 100?

Now you can see that tens multiplied by 100 equal thousands.

Now see what happens when you multiply hundreds by 100.

$100\times100=10000$ $\quad$ $100\times400=40000$

$100\times200=20000$ $\quad$ $100\times500=50000$

$100\times300=30000$ $\quad$ $100\times600=60000$

How many zeros would you affix after 700 if you multiplied it by 100? How many zeros would you affix after 800? After 900?

Now you can see that when you multiply any number by 100, you affix 2 zeros to it.

In the equation $200\times60=n$, think of 200 as 2×100. Then you can solve the equation like this.

$(2\times100)\times60=n$
$2\times(100\times60)=n$
$2\times6000=n$
$12000=n$

You can solve the equation $200\times600=n$ as shown below.

$(2\times100)\times600=n$
$2\times(100\times600)=n$
$2\times60000=n$
$120000=n$

How does knowing how to multiply by 100 help you when you are to multiply by 200? By 300? By 400?

Oral Read. Replace n with the missing number word.

	a	*b*
1.	$100\times90=n$	$100\times900=n$
2.	$200\times60=n$	$200\times600=n$
3.	$200\times80=n$	$200\times800=n$
4.	$300\times50=n$	$300\times500=n$

Tell the number word you would use to complete each statement below.

5. 3 H×4 T= __ Th or __
6. 3 H×2 T= __ Th or __
7. 3 H×4 H= __ TTh or __
8. 3 H×6 H= __ TTh or __

Written Write each equation and statement in the oral exercise above. Solve each equation. Complete each statement.

245 means 200 + 40 + 5 or 2 H + 4 T + 5 O
×400 means 400 of each or 4 H of each
400 × 5 = 2000 1st partial product
400 × 40 = 16000 2nd partial product
400 × 200 = 80000 3rd partial product
Add 98000 product

Multiplying Three-Digit Numbers by Hundreds

The equation 400×245 is solved for you on the board. It may also be solved in a grid as below.

	TTh	Th	H	T	O
			2	4	5
		×	4	0	0
0 O×245=			0	0	0
0 T×245=		0	0	0	0
4 H×5 O=		2	0	0	0
4 H×4 T=	1	6	0	0	0
4 H×2 H=	8	0	0	0	0
Add	9	8	0	0	0

The product is 98,000.

To multiply 245 by 400 you can save time by simply multiplying first by 4. Move all digits two places to the left and affix two zeros. Why is this possible?

$$\begin{array}{r} 245 \\ \times 400 \\ \hline 98000 \end{array}$$

Now multiply 375 by 500 using two different methods. How much time did you save by using the short method?

Oral Be ready to explain each multiplication below.

TTh	Th	H	T	O
		3	4	6
	×	2	0	0
		0	0	0
	0	0	0	0
	1	2	0	0
	8	0	0	0
6	0	0	0	0
6	9	2	0	0

$$\begin{array}{r} 346 \\ \times 200 \\ \hline 69200 \end{array}$$

Written Copy. Solve each equation.

	a	*b*
1.	200×316 = n	400×241 = n
2.	700×878 = n	300×329 = n
3.	900×105 = n	500×121 = n
4.	200×284 = n	400×215 = n
5.	300×237 = n	800×124 = n
6.	400×105 = n	600×163 = n

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Multiplying Three-Digit Numbers by Three-Digit Numbers

To solve the equation 122×213 = n, you are to multiply by hundreds, tens, and ones. If you were to write all of the partial products, your work would look like this:

	TTh	Th	H	T	O
			2	1	3
		×	1	2	2
2 O×3 O=					6
2 O×1 T=				2	0
2 O×2 H=			4	0	0
2 T×3 O=				6	0
2 T×1 T=			2	0	0
2 T×2 H=		4	0	0	0
1 H×3 O=			3	0	0
1 H×1 T=		1	0	0	0
1 H×2 H=	2	0	0	0	0
Add	2	5	9	8	6

The equation can also be solved without writing all of the partial products, as shown below.

	213
	×122
2×213=	426
20×213=	426
100×213=	213
Add	25986

Oral Answer these questions.

1. In the above example, in which place-value position do you write the first digit of the first partial product? Of the second partial product? Of the third partial product? Why?

2. What are two ways to check the multiplication of 213 by 122?

Written Copy. Solve each equation. Check by changing the order of the multiplier and the multiplicand and multiplying again.

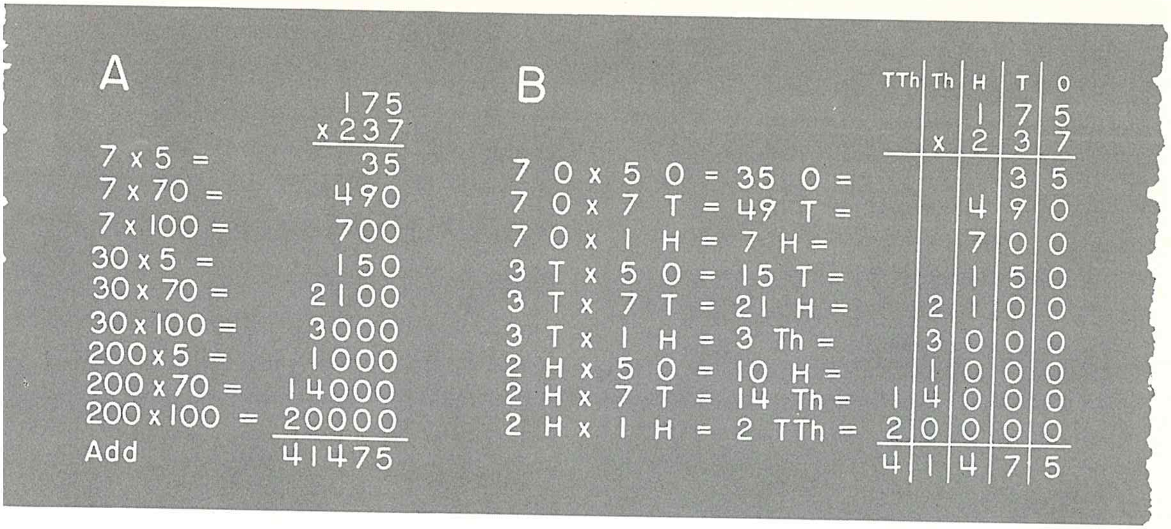
	a	*b*
1.	382×310 = n	123×402 = n
2.	987×111 = n	323×333 = n
3.	122×240 = n	123×301 = n
4.	221×400 = n	212×123 = n
5.	123×222 = n	114×221 = n

Solve these problems.

6. A dairy in one month sold 127 cases of eggs, with 144 eggs in each case. How many eggs did the dairy sell in all?

7. A milk driver delivered an average of 464 quarts of milk a day on his route. How much milk did he deliver in 312 days?

8. Mr. Bangs packed 201 boxes of apples. He hoped to sell them for $3.25 a box. How much would he receive for all 201 boxes of apples?



A

175
x 237

7 x 5 = 35
7 x 70 = 490
7 x 100 = 700
30 x 5 = 150
30 x 70 = 2100
30 x 100 = 3000
200 x 5 = 1000
200 x 70 = 14000
200 x 100 = 20000
Add 41475

B

	TTh	Th	H	T	O
			1	7	5
		x	2	3	7
7 O x 5 O = 35 O =				3	5
7 O x 7 T = 49 T =			4	9	0
7 O x 1 H = 7 H =			7	0	0
3 T x 5 O = 15 T =			1	5	0
3 T x 7 T = 21 H =		2	1	0	0
3 T x 1 H = 3 Th =		3	0	0	0
2 H x 5 O = 10 H =		1	0	0	0
2 H x 7 T = 14 Th =	1	4	0	0	0
2 H x 1 H = 2 TTh =	2	0	0	0	0
	4	1	4	7	5

Changing the Form of Numbers in Partial Products

The equation 237×175=n is solved for you on the board. A change in form was made in each partial product. You will probably write only 3 of the partial products, as shown below.

```
  175        237
 ×237       ×175
 1225       1185
 525       1659
350        237
41475      41475
```

Oral Answer the questions below.

1. In multiplying 175 by 237, why is the digit 5 of the product of 7 ones and 5 ones written in ones place? Why is the digit 5 of the product of 3 tens and 5 ones written in tens place?

2. What changes in form were needed in multiplying 175 by 2 hundred? In multiplying 237 by 1 hundred?

Written Copy. Write each product. Check.

	a	*b*	*c*
1.	724 ×713	565 ×543	702 ×897
2.	309 ×635	500 ×375	434 ×462
3.	650 ×175	412 ×712	956 ×432
4.	174 ×174	616 ×496	339 ×538
5.	485 ×285	297 ×317	528 ×629

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Multiplying in a Shorter Way

Study the three multiplications below.

A

$$\begin{array}{r} 442\\ \times 201\\ \hline 442\\ 8840\\ \hline 88842 \end{array}$$

B

$$\begin{array}{r} 324\\ \times 220\\ \hline 6480\\ 648\\ \hline 71280 \end{array}$$

C

$$\begin{array}{r} 694\\ \times 400\\ \hline 277600 \end{array}$$

In A, what does the 0 in tens place of the second partial product help you remember? Why is the 4 of the second partial product written in hundreds place?

In B, why is the 8 of the first partial product written in tens place? Why is the 8 of the second partial product written in hundreds place?

In C, why is the 6 of the product written in hundreds place?

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Oral Tell which numerals are missing in each of the multiplications below.

a

$$\begin{array}{r} 525\\ \times 602\\ \hline 1050\\ \bullet\bullet\bullet\bullet\bullet\\ \hline 316050 \end{array}$$

b

$$\begin{array}{r} 814\\ \times 780\\ \hline \bullet\bullet\bullet\bullet\bullet\\ 5698\\ \hline 634920 \end{array}$$

Written Copy. Write each product. Check by changing the order of the multiplier and the multiplicand and multiplying again.

	a	*b*	*c*
1.	970 ×708	607 ×809	756 ×302
2.	300 ×204	106 ×407	320 ×201
3.	234 ×102	426 ×309	510 ×405
4.	126 ×240	828 ×140	185 ×350
5.	317 ×150	619 ×202	906 ×909
6.	530 ×360	444 ×410	397 ×890
7.	731 ×601	250 ×570	818 ×790
8.	962 ×480	494 ×890	401 ×920
9.	175 ×500	683 ×700	679 ×600
10.	352 ×100	843 ×300	560 ×200
11.	709 ×500	614 ×302	281 ×630

Estimating Answers to Problems

An airplane had seats for 112 passengers. It made 175 trips. If the plane had been filled on each trip, how many passengers would it have carried?

Because you are to think of equal groups as being put together, you multiply the numbers. The equation is $175 \times 112 = n$.

Can you estimate an answer? Is 175 nearer to 100 or to 200? Is 112 nearer to 100 or to 200? To make an estimate multiply 200 by 100. Why? Is 20,000 passengers a good estimate? Solve the equation $175 \times 112 = n$ to find out.

Oral Read each problem carefully. Decide upon the equation to use in solving it. Choose the estimated answer in ( ) which seems most nearly correct. Be ready to tell why you chose your estimate.

1. Together, Dick and his brother delivered an average of 125 papers a day. About how many papers will they deliver in 312 days? (40,000 papers, 29,000 papers, 31,000 papers)

2. Mr. Breit plans to make a monthly payment of $89 on his new car. He must make payments for 2 years. About how much does he owe on the car? ($180, $2400, $2200)

3. An airplane had flight time of 295 hours. The owner said that he averaged about 115 miles an hour of flight time. About how far did the owner think that he had flown the plane? (3,000 miles, 30,000 miles, 33,000 miles)

4. An airplane had flight time of 879 hours. It was due for an overhaul at 1000 hours. About how many more hours could the plane fly before being overhauled? (100 hours, 150 hours, 120 hours)

5. A plane made a 2350-mile trip in 6 hours. What is a good estimate of its average hourly speed? (235 miles, 400 miles, 300 miles)

Written Follow these directions.

Write an equation for each problem above. Solve the equations. Check to see how nearly correct your estimate was. Number your equations 1, 2, 3, 4, and 5.

Solve the following equations.

6. $n - (10 + 15) = 50$

7. $n + (8 + 7) = 100$

8. $(25 + 30) - n = 17$

9. $(n + 50) - 10 = 60$

10. $(3 \times 100) \div 4 = n$

Reviewing Addition, Subtraction, Multiplication, and Division

You should be able to do the work on this page without any help.

Part 1 Copy. Find each sum. Check.

	a	*b*	*c*
1.	5630 4050 +8792	9258 6307 +4128	\$17.30 96.30 +74.18
2.	7489 6201 +8976	5209 3406 +6734	\$52.96 34.08 +29.13
3.	1008 9342 7615 +8743	5160 8952 1473 +6098	\$67.24 51.87 43.98 +15.09
4.	1795 3547 6596 +3828	7698 4893 5020 +4139	\$43.21 90.57 68.06 +32.41

Part 2 Copy. Find each difference. Check by using addition.

	a	*b*	*c*
1.	7365 −6924	9178 −1615	\$78.60 −47.35
2.	9121 −8065	7942 −5803	\$54.31 −10.14
3.	6482 −5667	8406 −3729	\$67.58 −24.78
4.	6000 −4175	3298 −1009	\$78.00 −15.76

Part 3 Copy. Find each quotient. Check by using multiplication.

	a	*b*	*c*
1.	$5\overline{)638}$	$2\overline{)519}$	$3\overline{)758}$
2.	$6\overline{)2769}$	$5\overline{)6070}$	$8\overline{)9034}$
3.	$3\overline{)8213}$	$2\overline{)1502}$	$7\overline{)4831}$
4.	$6\overline{)4170}$	$3\overline{)5001}$	$4\overline{)9152}$

Part 4 Copy. Find each product. Check by changing the order of the multiplier and the multiplicand and multiplying again.

	a	*b*	*c*
1.	513 ×90	170 ×65	580 ×54
2.	742 ×60	910 ×27	850 ×72
3.	328 ×300	916 ×510	243 ×453
4.	342 ×133	647 ×285	508 ×476

Part 5 Solve the following equations.

	a	*b*
1.	$(580-54)\div 3=n$	$(851+73)\div 7=n$
2.	$(n\times 7)+9=72$	$(15\times 4)\div n=12$

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. When you multiply a number by 10, name the number and affix a zero. (219)

2. When you multiply a number by 100, name the number and affix 2 zeros. (225)

3. When you check multiplication, change the order of the multiplier and the multiplicand and multiply a second time. (224)

Questions to Discuss

1. Which numerals are missing in each partial product below? (221)

```
                                 795
                                 ×38
                                ----
8 0×5 0= __ 0=                    --
8 0×9 T= __ T=                   ---
8 0×7 H= __ H=                  ----
3 T×5 0= __ T=                   ---
3 T×9 T= __ H=                  ----
3 T×7 H= __ Th=                -----
                               -----
                               30210
```

2. Why are partial products unnecessary in multiplying 824 by 60? (222)

3. How can you decide upon the operation you are to use in solving a problem? (223)

4. Why is changing the order of the multiplier and the multiplicand and multiplying again such a good check for multiplication? (224)

5. How many partial products are needed in multiplying 442 by 201? 694 by 400? (230)

Written Practice

Copy. Solve each equation. Check each answer.

	a	*b*	
1.	34×234 = n	22×418 = n	(220)
2.	900×8 = n	700×5 = n	(225)
3.	100×90 = n	300×400 = n	(226)
4.	400×252 = n	600×138 = n	(227)
5.	132×402 = n	121×212 = n	(228)
6.	437×565 = n	265×418 = n	(229)
7.	210×356 = n	504×605 = n	(230)

Solve these problems.

8. Terry earned an average of $1.25 a week for 24 weeks. How much did he earn altogether? (221)

9. In 5 years Mr. Thomas paid $2475 in taxes. What were his average taxes each year? (223)

Self-Evaluation

Part 1 Copy. Write each sum, difference, or product. Check.

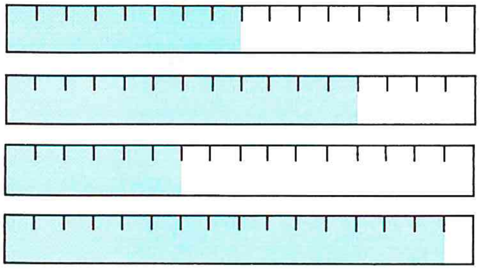
	a	*b*	*c*
1.	2623 5127 4704 +6186	8294 1816 6248 +88757	2361 7935 9378 +3459
2.	9190 −4309	7818 −6241	5427 −1732
3.	496 ×37	924 ×195	757 ×784

Part 2 Copy. Write each quotient and product. Check.

	a	*b*
1.	627÷6=n	559×537=n
2.	799÷7=n	n=965×8012
3.	6843÷2=n	364×7625=n
4.	8657÷7=n	427×5319=n

Part 3 Follow these directions.

1. Write a fraction that tells which part of each drawing is blue.



2. Write a fraction that tells which part is white.

Answer each question below.

3. Which is more, $\frac{1}{2}$ foot or $\frac{3}{4}$ foot?

4. Which is more, $\frac{1}{2}$ pound or $\frac{3}{8}$ pound?

5. Which is more, $\frac{1}{2}$ gallon or 3 quarts?

6. Which is more, $\frac{1}{4}$ pound or 5 ounces?

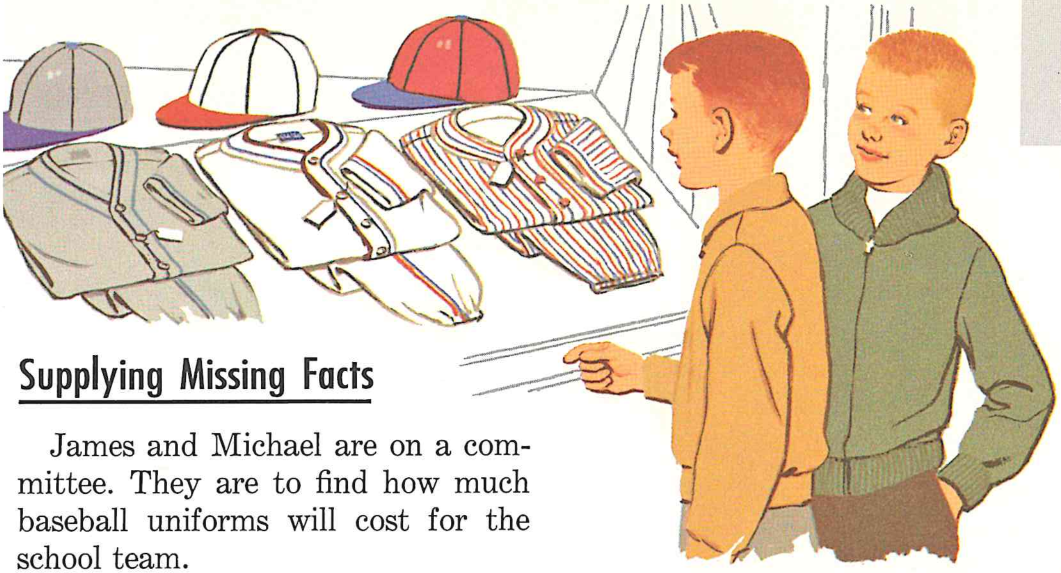
Part 4 Write an equation for each problem below. Solve the equation. Write the correct answer.

1. Margaret had \$10.00. She bought shoes for \$7.98 and a pair of gloves for \$.79. How much money did Margaret have left?

2. The fourth-grade class collected 225 pounds of newspapers on Monday, 129 pounds on Tuesday, 170 pounds on Wednesday, and 85 pounds on Thursday. On the average, how many pounds were collected each day?

3. Mr. Perkins bought 2 quarts of oil at \$.55 a quart. His gas cost \$2.40. How much did Mr. Perkins pay altogether?

4. Mrs. Jones cut a pie into 8 pieces. The family ate $\frac{3}{4}$ of it. How many pieces did they eat?



Supplying Missing Facts

James and Michael are on a committee. They are to find how much baseball uniforms will cost for the school team.

The questions below suggest what they must know before they can find out how much the uniforms will cost.

How many uniforms are needed?

Do all of the uniforms cost the same amount?

How much will each uniform cost?

Will there be a tax to pay? How much will it be?

Many problems are similar to the one which James and Michael have. You know the question part of the problem. You must have information before you can answer the question.

Oral Be ready to tell what facts you would need before you could solve the problems below.

1. Betty has a number of candy eggs. She is going to share them with a number of girls, giving each girl the same number of pieces. How many pieces of candy should she give each girl?

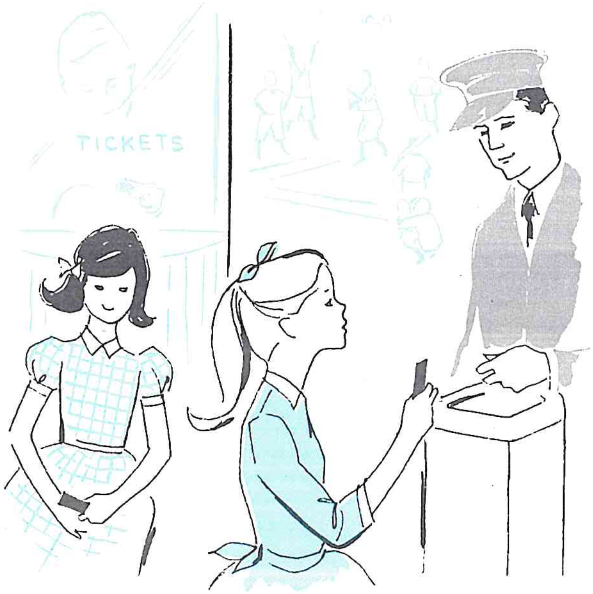
2. How much more money does Bob need before he can buy the football he wants?

3. What will a certain number of records cost?

4. A different number of lunches are served in a cafeteria each day. How many lunches are served in a certain number of days?

5. How many ice cream cones can Sally buy with her money?

Written Supply sensible missing facts for each problem above. Use the facts in writing an equation for each problem. Solve the equation. Write your answer.



Supplying the Questions

The statements on this page are taken from problems. You are to supply the questions.

Next read each statement and the question you supplied. Write the equation to use in solving each story problem.

Then read each statement again. This time try to supply a question that leads to an equation which can be solved by using an entirely different operation.

1. John weighed 89 pounds and his father weighed 175 pounds.

2. For the first game of the season, 1170 tickets were sold. For the second game of the season, 1098 tickets were sold.

3. A storekeeper ordered a dozen boxes of pencils with 144 pencils in each box.

4. The population of a town was 9380 in 1950 and 9795 in 1960.

5. An airplane flew 1455 miles in 5 hours.

6. Mr. Rogers bought 225 gallons of oil at 17¢ a gallon.

7. A clerk cut 13 yards of material from a bolt of material that had 50 yards of material on it.

8. The temperature was 10° at night and rose to 68° during the day.

9. A plane that was due at 11:00 a.m. arrived at 1:00 p.m.

10. The Lincoln School had 987 pupils and the Franklin School had 1071 pupils enrolled.

Oral Be ready to read each of the above statements, supplying a question for each. Tell which equation you would use in solving the problem and why you chose it.

Something to do Write 3 problems that can be solved by using addition. Then rewrite the same problems, changing the questions in such a way that they would be solved by using subtraction.

To Find This Number	Use This Operation
How many in all of the unequal groups	addition
How many in all of the equal groups	multiplication
How many are left	subtraction
By how many one set differs from another	subtraction
How many in each equal group	division
How many equal groups	division

Practicing Problem Solving

Read each story problem carefully. Decide upon the equation to use in solving it.

1. In our city you can park 12 minutes for each penny you put into the parking meter. When Jane went shopping she put 4 pennies into the meter. How much time should be shown on the meter?

2. Caroline's mother bought 4 pounds of steak at the grocery store for $5.16. How much did each pound of steak cost?

3. Tom and his father packed 259 bags of apples, with 5 pounds in each bag. How many pounds of apples were packed altogether?

4. A filling station man sold 3225 gallons of gasoline on Saturday and 2918 gallons on Sunday. How many gallons of gasoline did he sell on the week end?

5. By air, the distance from Chicago to Los Angeles is 1745 miles, and from Chicago to San Francisco it is 1858 miles. How much farther is it to San Francisco than to Los Angeles by air?

6. On a business trip, Mr. Holmes flew 701 miles from Houston, Texas, to Atlanta, Georgia, and 748 miles from Atlanta to New York City. Then he flew 2451 miles to Los Angeles and 1374 miles from Los Angeles home to Houston. How many miles did he fly altogether?

Oral Be ready to tell the equation you would use in solving each problem above and why you would use it.

Written Write the equation for problems 1 through 6. Solve each equation. Read each problem again to see whether your answer is sensible. Write your answer.

Supplying Missing Information

What fact is missing in the problem below?

Linda had a book to read. She read 137 pages. How many more pages did she have to read?

Did you decide that you have to know how many pages were in the book? What would be a sensible number to supply?

Read the problems below and decide what information, *if any,* is missing in each one.

1. 18 children each paid the same amount of money for tickets on a boat. How much did they pay in all?

2. 24 children were going to a picnic in cars with the same number of children in each car. How many cars were needed?

3. Linda and Sue made 12 party favors in the morning. They made some more after lunch and stopped when they had 25. How many party favors did they make after lunch?

4. The pupils in a class formed 4 committees with the same number on each committee. How many pupils were on each committee?

5. Jane had some pennies in her bank. After spending 15 of them one morning, she counted the pennies that were left. How many pennies were in her bank before she spent any that morning?

6. 35 children went to a lake. Some of the children went swimming, but others did not. How many children did not go swimming?

7. John had 14 marbles. Bill had 3 times as many marbles as John. How many marbles did Bill have?

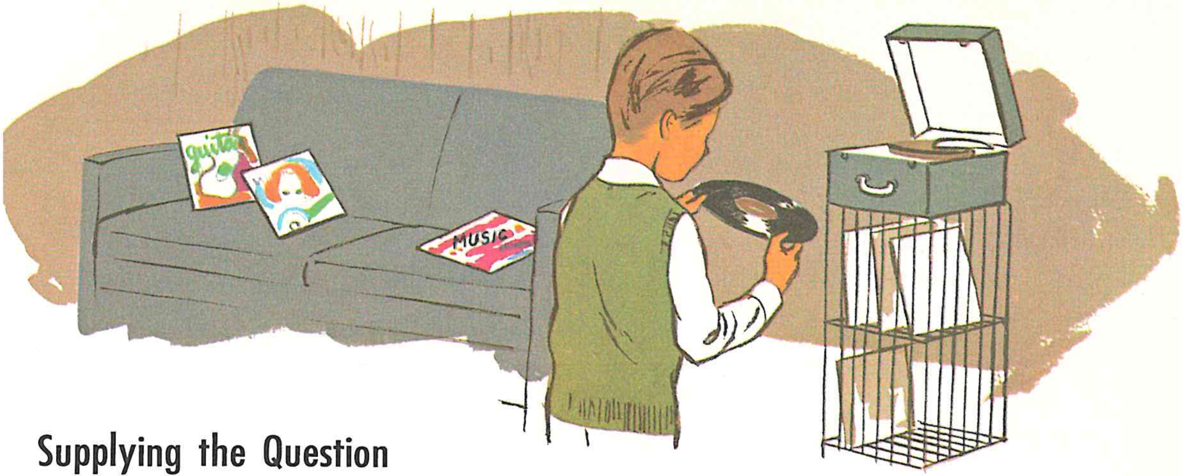
8. Each of the 4 school buses was loaded with the same number of children. 144 children rode on the buses. How many children were on each bus?

9. Jimmie is only 11 years old. What is the difference between his age and his grandfather's age?

10. 27 boys and some girls were on the playground. The number of boys on the playground is how many times the number of girls on it?

Oral Tell what information, if any, you would supply for each problem above. Also tell what equation you would use in solving each problem and why you would use it.

Written Write an equation for problems 1 through 10. Solve each equation. Check to see if your answer is sensible. Write your answer.



Supplying the Question

Read the story part of each problem below. Think of a question or questions to supply for each problem. The sign or signs in ( ) will help you decide what question to supply for each problem.

1. Doris spent $1.35, Mary spent $1.19, and Beverly spent $.98. (+, −, or + and ÷)

2. 87 children bought cafeteria tickets at 35¢ each. (×)

3. Robert spent $2.37 for 3 records. Each of the records cost the same amount. (÷)

4. 125 cars and 29 trucks passed a school in 15 minutes. (+ or −)

5. 115 parents came to an open house at school. 39 of them came during the day. The rest came in the evening. (−)

6. Ann had some money to use in making change at the school store. She sold $8.25 worth of supplies. Then she had $10.00. (−)

7. Dick went into a store with $1.25 in his pocket. After buying 5 candy bars he had 20¢ left. (−)

8. Billy's team made 18 runs. John's team made 9 runs. (− or ÷)

9. Betty's new bicycle cost $39.88, and Beverly's new bicycle cost $44.50. (+ or −)

10. At the beginning of a library hour, 51 children were in the library. By the end of the hour all 85 seats were filled. (−)

Oral Be ready to tell the question or questions you supplied for each problem above.

Written After you supply the question, write an equation you would use in solving problems 1 through 10. Solve the equation. Write the answer to the problem.

Solving Problems

Read each problem carefully. Decide whether you would add, subtract, multiply, or divide, and how you would change each problem into an equation.

1. Dick and his father took an airplane trip to New York. Their round-trip tickets, including tax, cost $29.78 each. How much did they pay for tickets?

2. The tax on each ticket was $2.71. How much of the cost of the 2 tickets did Dick and his father spend for tax?

3. Their hotel bill for one night was $12.60 and their dinners cost $2.85 each. How much did they spend for the hotel and both dinners for one night?

4. A jet plane flew 990 miles in 2 hours. What was its average hourly speed?

5. Mary has to spend 25¢ a day on bus fare to school. She also spends 45¢ a day for lunch at the school cafeteria. How much does she spend for bus fare in 20 school days?

6. Betty's father used 129 gallons of gasoline one month. The gasoline cost 35¢ a gallon, and his car goes 14 miles on each gallon. How many miles did he drive that month?

7. Mr. Jensen was making an automobile trip of 1050 miles. He had driven all but 378 miles when his car broke down. How far had he driven?

8. On a trip by train Roger spent $1.35 for lunch and John spent $1.50. How much in all did the boys spend for lunch?

9. Mary spent $13.29 for a train ticket and $2.25 for meals on the train. She had $20 when she left home. If she hadn't spent any other money, how much of the $20 should be left?

10. A jet plane began a trip with 79 passengers. At its first stop no one left the plane, but some people got on. Then there were 91 passengers. How many people got on?

11. A plane carried 108 passengers on each of 12 trips. How many passengers in all did the plane carry?

Oral Be ready to tell the equation you decided upon for each problem above and why you decided upon it.

Written Write an equation for each problem above. Solve each equation. Read the problem again to see if your answer is sensible. Then write the answer.

Practicing Addition, Subtraction, Multiplication, and Division

Part 1 Copy. Write each sum or difference. Check.

	a	*b*	*c*	*d*
1.	1529	5643	235	3268
	9742	2719	694	1072
	4528	1291	368	3151
	+9861	+8473	+7587	+4869
2.	4561	8494	7136	6458
	9836	3542	5479	3927
	+2479	+8367	+3824	+4631
3.	9321	8407	7329	4541
	−4191	−5214	−3432	−3645

Part 2 Copy. Write each product. Check.

	a	*b*	*c*	*d*
1.	1257	6561	3987	9195
	×6	×2	×5	×6
2.	3351	2636	7286	4169
	×7	×3	×2	×4

Part 3 Copy. Write each product. Check.

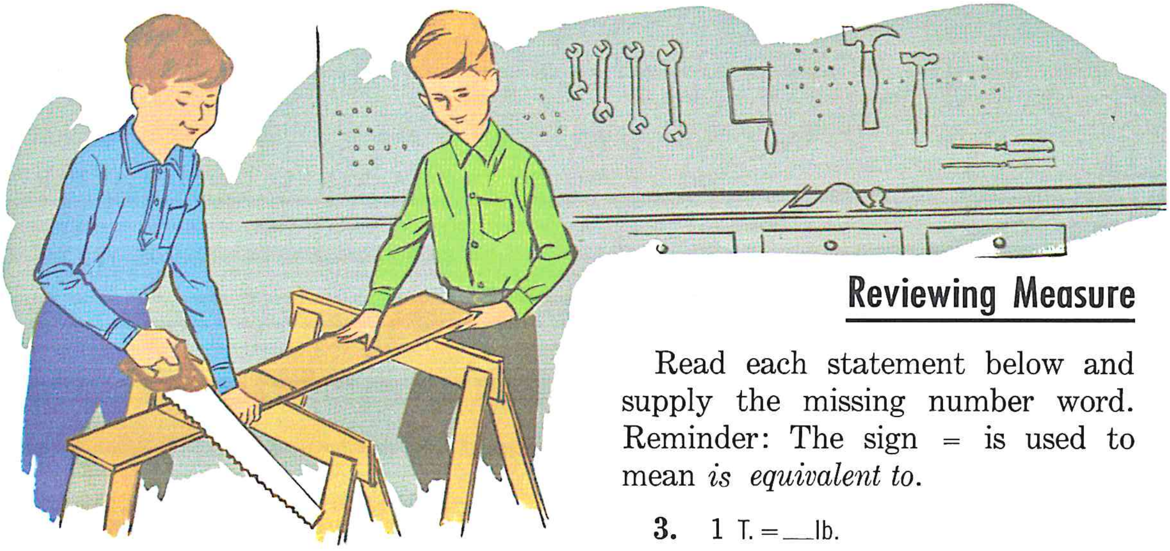
	a	*b*	*c*	*d*
1.	631	758	646	467
	×45	×46	×65	×89
2.	579	145	898	989
	×263	×582	×371	×494
3.	562	413	806	763
	×447	×370	×598	×605

Part 4 Copy. Write each quotient. Check.

	a	*b*	*c*
1.	$3\overline{)762}$	$5\overline{)875}$	$9\overline{)828}$
2.	$6\overline{)564}$	$8\overline{)360}$	$7\overline{)651}$
3.	$7\overline{)803}$	$5\overline{)767}$	$4\overline{)570}$
4.	$4\overline{)8000}$	$6\overline{)6072}$	$8\overline{)4216}$
5.	$7\overline{)8809}$	$3\overline{)9605}$	$5\overline{)9807}$
6.	$9\overline{)5498}$	$7\overline{)3683}$	$2\overline{)7359}$
7.	$6\overline{)2942}$	$3\overline{)8450}$	$5\overline{)6111}$
8.	$8\overline{)6904}$	$4\overline{)9001}$	$6\overline{)7780}$

Part 5 Copy. Solve each equation.

	a	*b*
1.	$n+350=1000$	$245+n=300$
2.	$434+n=525$	$n+800=1130$
3.	$n-19=100$	$145+n=185$
4.	$n-356=44$	$735+n=810$
5.	$n\times7=35$	$9\times n=990$
6.	$n\times7=63$	$8\times n=160$
7.	$639\div n=9$	$n\div6=8$
8.	$n\div8=40$	$525\div n=5$



Reviewing Measure

If Bob works carefully, he will have 4 pieces of board each 12 inches, or 1 foot, long. What will be the combined length, in inches, of the four 1-foot pieces? You can answer the question by using this equation: $4\times12=n$. The value of n is 48. 4 feet are equal in length to 48 inches.

You use a different equation to help you answer the question: How many feet are equal in length to 48 inches? The equation is $48\div12=n$, because there are 12 inches in 1 foot. The value of n is 4.

Oral Answer these questions.

1. What equation will you use in changing the form of 9 feet to yards? Of 9 yards to feet?

2. What equation will you use in changing the form of 8 quarts to gallons? Of 8 gallons to quarts?

Read each statement below and supply the missing number word. Reminder: The sign = is used to mean *is equivalent to.*

3. 1 T. = __lb.

4. 1 wk. = __da.

5. __qt. = 1 gal.

6. 1 yd. = __ft.

7. __in. = 1 yd.

8. 1 da. = __hr.

9. 1 doz. = __things

Written Write an equation to use in deciding what number to use in each statement below. Solve the equation. Copy and complete each statement.

1. 6 gal. = __qt.

2. __min. = 3 hr.

3. 28 da. = __wk.

4. 8 wk. = __da.

5. 21 ft. = __ yd.

Practice in Making Up Problems

Write a problem of your own that is suggested by each situation indicated in statements 1 through 10 below. Be sure each problem contains all the necessary facts.

1. You and a friend are going to the store to buy some peanut butter and jam.

2. You want to share some candy with some friends, giving each person the same amount.

3. You are scorekeeper at a ball game.

4. You want to buy a model airplane kit with money you have saved.

5. You want to know the length of each piece if you cut a strip of cardboard into equal pieces.

6. You want to buy a cake.

7. You want to know how much time you spend watching television each week.

8. You want to find how much money several books of the same kind will cost.

9. You want to know how many cars are needed to take all of the pupils to a picnic.

10. You and a friend are going to put your money together to buy candy.

Oral Tell the class the problem you have written for each of the ten situations suggested above and what equations are to be used in solving them.

A quick review

1. $(168 \div 4) \div n = 6$
2. $(236 - 34) \div 9 = n$
3. $(25 \times 370) - 6838 = n$
4. $1000 - (498 + 375) = n$
5. $2418 + (6759 + 3041) = n$
6. $n - (315 \times 315) = 17{,}000$
7. $n \times (7 \times 68) = 4760$

Read each problem carefully. Pay special attention to the question. Decide whether to add, subtract, multiply, or divide to answer it. Write each problem as an equation, but do not solve the equation.

1. In one school there were 79 pupils in grade 1, 83 pupils in grade 2, 65 pupils in grade 3, and 88 pupils in grade 4. How many pupils were in these four grades?

2. In another school there were 121 pupils in fourth grade, 137 pupils in fifth grade, and 117 in sixth grade. What was the average number of pupils in each grade?

3. Bob can buy boards for 15¢ a foot. He needs 2 boards, each 12 feet long. How much money does he need for the boards?

4. Betty can buy material at 79¢ a yard. She wants to buy 5 yards of material. How much money does she need if she buys the material and pays 12¢ tax on it?

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5. John paid $39.98 for a bicycle. The cost included $1.20 for tax. What was the cost of the bicycle without tax?

6. There were 54 fourth graders on a playground. The playground leader wanted to divide the pupils into 6 teams. How many players did he have for each team?

7. Susan used 18 sheets of colored paper to make a scrapbook. She still has 44 pieces which she hasn't used. How many sheets of colored paper did she have before she made her scrapbook?

8. Ann wanted a record that cost $1.98. She had $1.39. How much more money did she need?

9. The Dell's have a city lot that is 71 feet wide. It is twice as long as it is wide. How long is the lot?

10. A milkman left 144 cartons of milk. The pupils drank the milk in all but 17 of the cartons. How many cartons of milk did the children drink?

11. The boys set up 64 chairs in groups of 4 chairs each. How many groups of chairs did they set up?

12. Alice's father is 45 years old. Alice is 9 years old. Her father's age is how many times more than Alice's?

Oral Be ready to tell the class the equation you wrote for each problem. Tell why you decided on each equation you wrote.

Written Solve each equation. Write the answer for each problem.

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. The question part of a story problem gives the information needed in deciding how to change a problem into an equation. (236, 237)

2. A problem solver may have to decide which information to use in solving a problem. (238)

3. After solving the equation, one should reread the problem to see whether the answer is sensible. (237)

Questions to Discuss

1. How can you decide upon the operation that you should use in solving a problem? (237)

2. How can you decide whether to add or to multiply to solve a problem? (237)

3. Which operation do you use when you are to find how many in each equal group? When you are to find how many equal groups? (237)

4. What are some kinds of information which you are sometimes asked to supply before you write the equation for a problem? (235)

5. How does changing the question in a problem change the equation you use in solving it? (236)

Written Practice

Write the equation for each problem below. Solve the equation. Then write the answer to the problem. (237)

1. Billy and John and George together earned $2.25 on a Saturday. Each boy received the same amount as his share. How much money did each boy get?

2. Mr. White wanted to arrange 120 chairs into rows with 8 chairs in a row. How many rows of chairs did he have after they were arranged?

3. Mr. Johnson drove 44 miles the first hour, 39 miles the second hour, and 40 miles the third hour. What was his average speed for each of the 3 hours?

4. Walter had 75 newspapers to deliver. He delivered 49 before dinner and the rest after dinner. How many newspapers did he have to deliver after dinner?

5. A truck hauled 2 tons of flour on each trip. How many pounds of flour would it haul on 6 trips?

6. A spool holds 18 yards of ribbon. How many inches of ribbon are on the spool?

Self-Evaluation

Part 1 Write equations in which you do the following. Solve each equation.

1. Use 19 and 37 as addends.

2. Use 46 as an addend and 60 as a sum.

3. Use 14 as a subtrahend and 35 as a minuend.

4. Use 11 as a difference and 21 as a minuend.

5. Use 56 as a dividend and 8 as a divisor.

Part 2 Copy. Supply the missing signs.

1. 115___5 = 110

2. 115___5 = 575

3. 115___5 = 120

4. 115___5 = 23

5. (9___3) − 27 = 0

6. (9___3) × 6 = 18

7. (9___3) ÷ 6 = 4 r3

8. (9___3) + 6 = 33

9. (9___3) − 6 = 21

10. (9___3) × 6 = 36

Part 3 Copy and complete each statement below. Remember that the sign = is used to mean *is equivalent to.*

a

1. ___sec. = 1 min.

2. 12 in. = ___ft.

3. ___mo. = 1 yr.

4. 1 gal. = ___pt.

5. 1 hr. = ___min.

6. 1 mi. = ___ft.

b

7. 1 pk. = ___qt.

8. ___c. = 1 pt.

9. ___oz. = 1 lb.

10. ___lb. = 3 T.

11. 2 wk. = ___da.

12. ___bu. = 8 pk.

Part 4 Solve these problems.

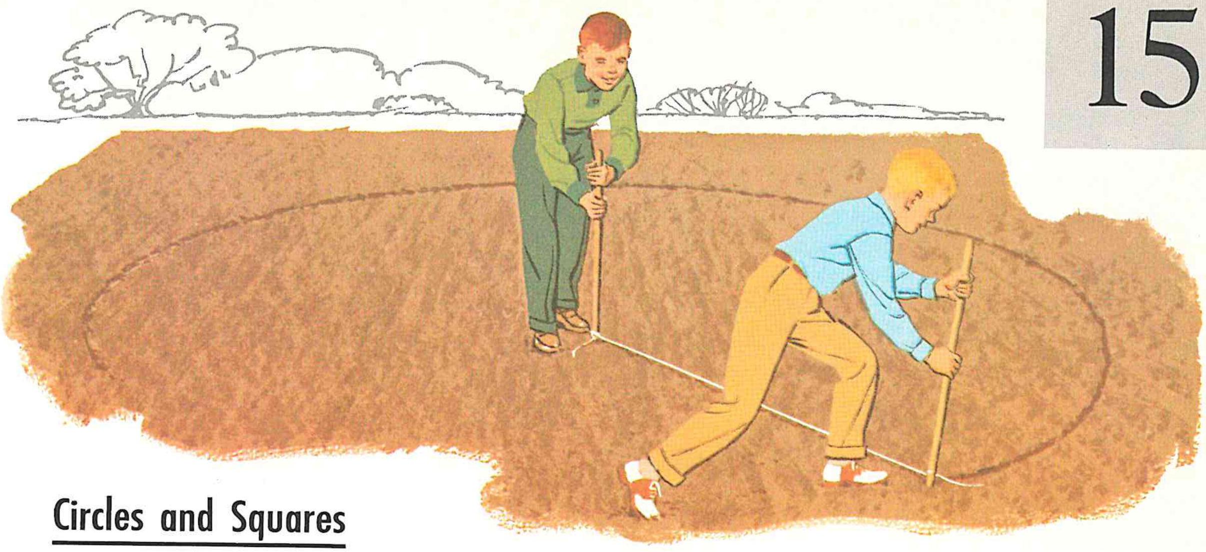
1. Mrs. Johnson can take 9 pupils in her station wagon. What is the least number of trips she would have to make to take 32 pupils to a park?

2. Expenses of $5.25 were shared by 5 boys. Each boy paid the same amount. How much did each pay?

3. Mr. Roger earned $2.25 an hour and worked for 8 hours one day. How much money should he receive for his day's work?

4. A large car weighed 5175 pounds. A smaller car weighed 2985 pounds. How much heavier was the larger car?

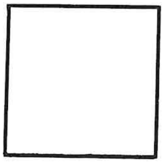
15



Circles and Squares

Have you ever tried to make figures, using the method shown in the picture above? If not, try to make some. Figures drawn in this way are called **circles.** The point represented by the stick that isn't moved is called the **center of the circle.** Are all points on a circle the same distance from its center? Objects that have the shape of the figure you have made are called **circular.**

Suppose the boys had planned to make a garden with the shape of this figure.



Does the figure have 4 straight sides? Are they all the same length? How many corners does the figure have?

A figure having 4 sides all the same length and 4 corners all the same size is called a **square.**

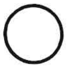
The corners of a square are formed by 2 straight lines that start from a common point. The figure they make is called an **angle.** In a square, all of the angles are **right angles.**

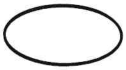
Oral Answer these questions.

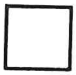
1. What objects in the classroom have at least one part that is in the shape of a circle?

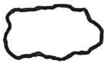
2. What objects in your room have a square shape?

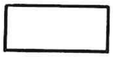
3. Which figures below represent circles and which represent squares?

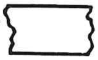
A 

B 

C 

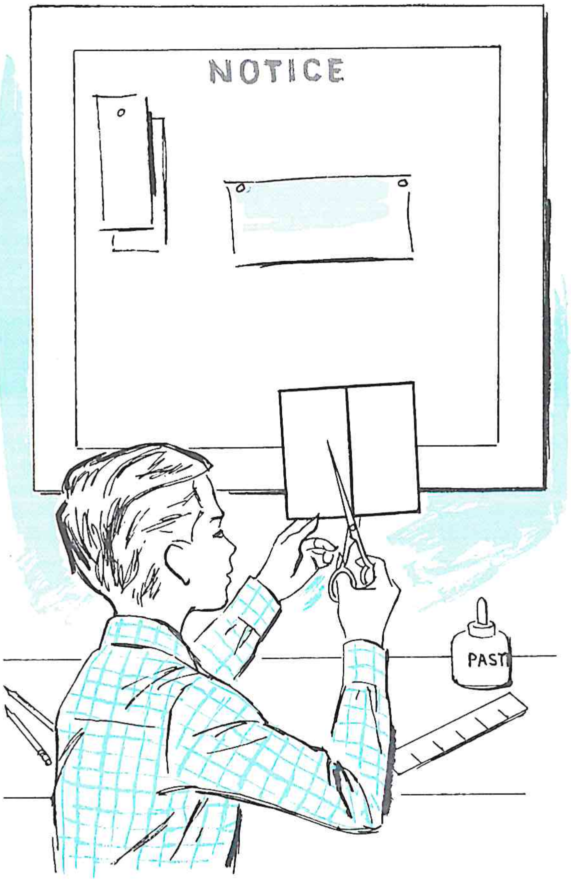
D 

E 

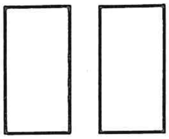
F 

Something to do Make collections of small objects or of pictures of objects that are either circular or square.

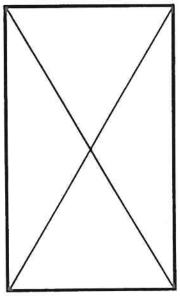
Rectangles



What is the shape of the paper that Bob is cutting? Does it have 4 straight sides? Does it have 4 right angles? Are the 4 sides the same length? As you can see, Bob began with a square. Here are the 2 pieces that he cut. They are no longer square in shape. The sides are not all the same length. Bob has made 2 **rectangles.**



In every rectangle opposite pairs of sides have the same length, and there are 4 right angles. Lines drawn from corner to corner, as shown, have the same length. The point at which they meet is at the halfway mark of each line.



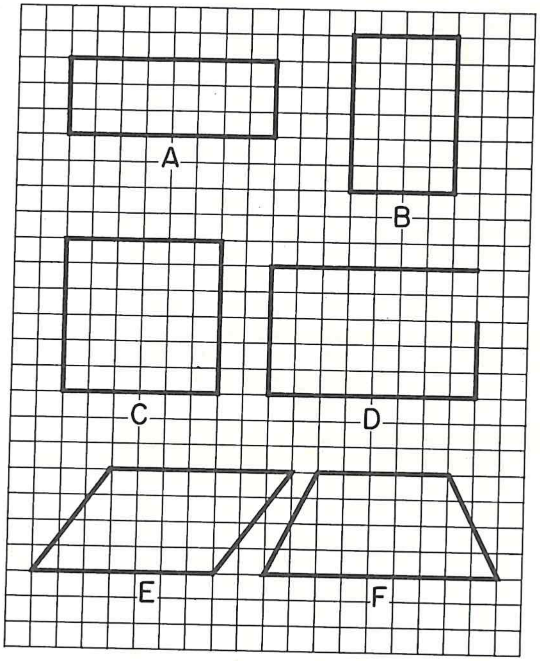
Apply the above tests to a square. Must every square be a rectangle? Why or why not?

Look at the pair of lines that form the 2 longer sides of a rectangle. Are they the same distance apart for their entire length? Are the lines that form the shorter sides the same distance apart for their entire length?

The lines that show the opposite sides of a rectangle must be the same distance apart over their whole length. Such lines are called **parallel lines.** Lines that are parallel do not cross each other, no matter how long you draw them.

Look at the pages of your book. Are the sides of the pages parallel? Are there 4 right angles? Is each page of your book a rectangle? Is each page a square?

Oral Look at the drawings on the squared paper below. Then answer the questions.



1. How many sides has drawing A? Are the long sides parallel? Are they the same length? Are the short sides parallel? Are the corners right angles? Does drawing A represent a rectangle? If so, why?

2. Does drawing B represent a rectangle? How can you tell?

3. Does drawing C represent a rectangle? Is it also a square? How do you know?

4. How can you tell that drawing D does not represent a rectangle?

5. Are the long sides of drawing E parallel? Are the short sides parallel? Why does drawing E not represent a rectangle?

6. How many pairs of parallel lines are in drawing F? How many right angles are in drawing F?

Something to do Use paper ruled in squares (squared paper) if you can get it. Otherwise use a ruler, pencil, and the corner of a piece of cardboard cut like this: . Use your cardboard to help you make your corner a right angle.

Then follow these directions.

1. Make a rectangle 4 inches long and 2 inches wide.

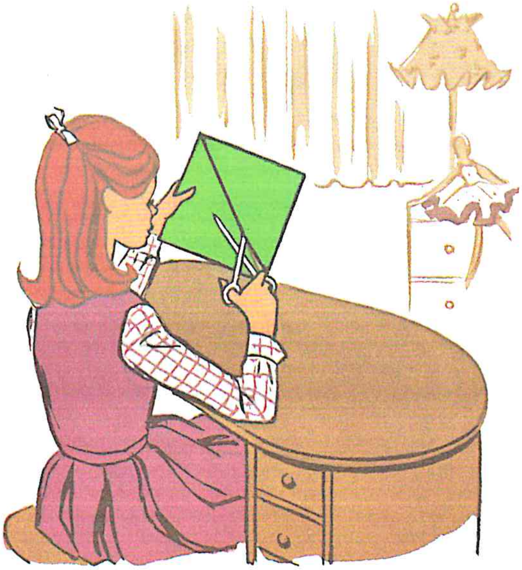
2. Make a square 3 inches long on each side.

3. Make a rectangle $3\frac{1}{2}$ inches long and $1\frac{1}{2}$ inches wide.

Can you do this? Each dot in the division below represents a missing numeral. Can you replace each dot with the correct numeral?

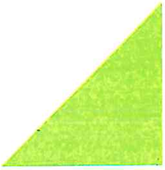
```
   ●●3
●)●6●●
  ●●
  ---
   2●
   ●1
   --
     ●
     ●
     -
     0
```

Triangles

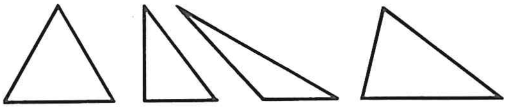


Look at the piece of paper that Agnes is cutting. Each piece has 3 sides. It has a shape of its own. It is called a **triangle,** because it has 3 angles. *Tri* means *three.* Every figure having three straight sides and three angles is called a triangle.

Here is 1 of the 2 triangles Agnes cut out. How many lines are needed to show its shape? The line across the bottom and up one side form one angle. How are the other angles formed?



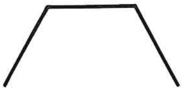
The pictures below show shapes of triangles. Does each have 3 sides?



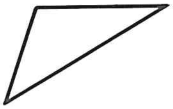
Oral Answer these questions.

1. Which of the drawings below represents a triangle? Why is it a triangle?

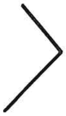
a



b



c



2. Can you make a triangle that has 2 right angles? Why or why not?

3. Which things can you see in your classroom that have the shape of a triangle?

Something to do

1. Draw a triangle with all sides the same length.

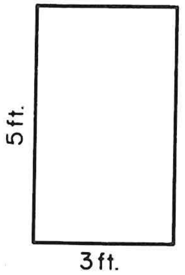
2. Draw a triangle having 1 right angle.

A quick review

	a	*b*
1.	$9728 \div 7 = n$	$6744 \div 6 = n$
2.	$23 \times 518 = n$	$497 \times 8042 = n$
3.	$(360 \div 4) \times 3 = n$	$n = (5280 \div 6) \times 5$
4.	$(20 \times 360) \div 8 = n$	$n = 147 \times (843 \div 3)$
5.	$(567 \div 3) \times 27 = n$	$n = (918 \div 6) \times 315$
6.	$30 \times (528 \div 3) = n$	$n = 28 \times (876 \div 6)$

Measuring Rectangular and Square Figures

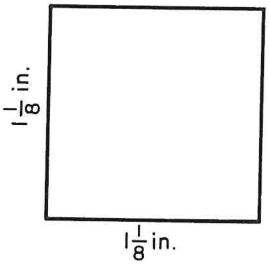
Ronald measured the width of the table. The table is exactly 3 feet wide. The table is exactly 5 feet long. Ronald then drew a rectangle having the same shape as the table. He wrote *3 ft.* on one of the shorter sides and *5 ft.* on one of the longer sides, like this.



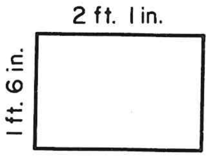
He has given the **dimensions** of the table. In giving dimensions you must tell both the number of units and the kind of units used in measuring an object.

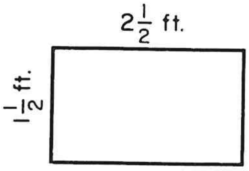
Why did Ronald not need to write *3 ft.* on both of the shorter sides? Why was it unnecessary to write *5 ft.* on both of the longer sides?

Look at the dimensions of this square. How long is each side of it?



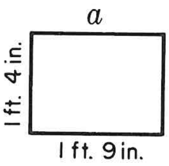
Dimensions are sometimes given in two different units or in fractions:

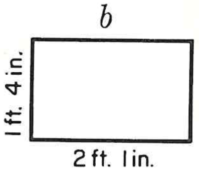


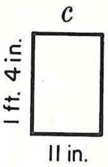


Oral Read the dimensions of each rectangle below.

1.







Read. Supply the missing number word. Here, = means *is equivalent to.*

2. 1 ft. 9 in. = __in.

3. 1 ft. 4 in. = __in.

4. 2 ft. 1 in. = __in.

5. 5 ft. 10 in. = __in.

6. 2 yd. 1 ft. = __ft.

Written Copy 2 through 6 above. Supply the missing numeral.

Something to do Use squared paper if you can get it. Otherwise use a triangle with 1 right angle. Follow these directions.

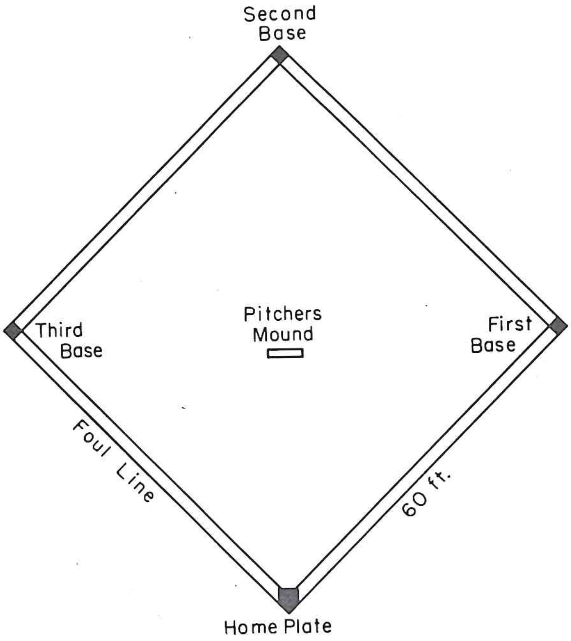
1. Draw a rectangle any size you wish and write its dimensions.

2. Draw a $2\frac{1}{2}$ inch square and write its dimensions.

3. Draw a triangle any size you wish and write on it the length of each side.

MORE PRACTICE PAGE 317

Finding the Perimeter of a Square



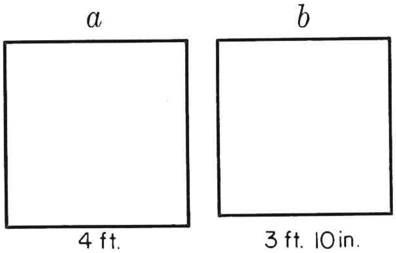
Is the baseball diamond a square? How can you tell? What is the length of each side of the square? How would you find the distance around the baseball diamond?

You could measure the distance, but to do that would be slow. You could add, like this: 60+60+60+60=n. But because the addends are equal, you could multiply, like this: 4×60=n. The value of n is 240. The distance around the square is 240 feet. A single word that means *distance around* is **perimeter.**

MORE PRACTICE PAGE 317

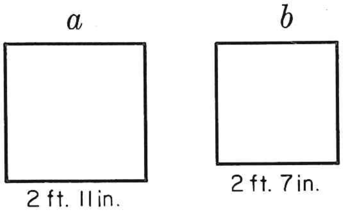
If you know the perimeter of a square, you can find the length of each side. Simply divide the perimeter by 4. Why will doing this give the dimensions of the square?

Oral Tell two ways for finding the perimeter of square *a* in feet and square *b* in inches.

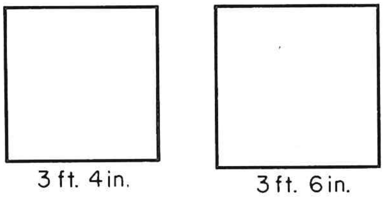


Written Write the perimeter of each square below in inches.

1.



2.



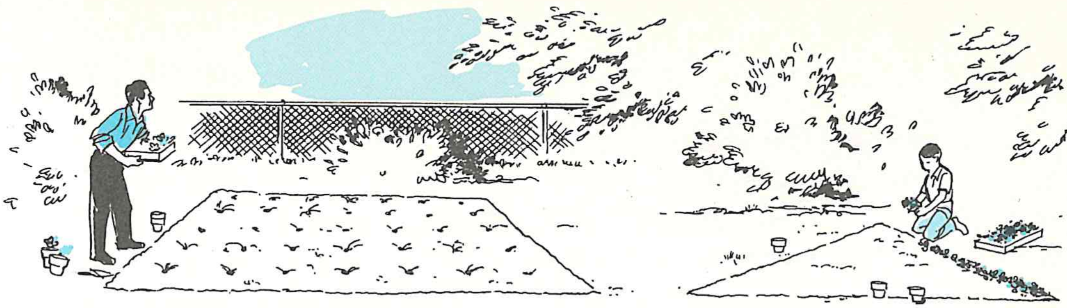
Write each statement. Supply the missing numeral.

3. 5 ft. 4 in. = ___ in.

4. 4×64 in. = ___ in.

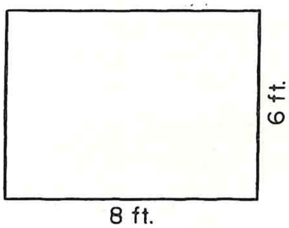
5. 7 ft. 6 in. = ___ in.

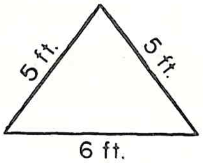
6. 4×90 in. = ___ in.



Finding the Perimeter of a Rectangle and of a Triangle

Arthur's father made the following sketch for his 2 new flower beds.





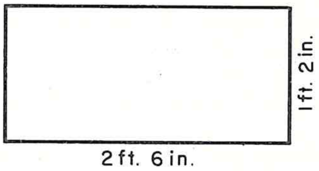
How many feet of woven wire will Arthur's father need to put a fence around each flower bed? Look at the rectangle first. To find the perimeter of the flower bed, you must think of the lengths as being taken together; so you add. The equation is $6+8+6+8=n$.

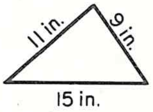
Some of the addends are alike. You might save time by using multiplication. The equation could be $2\times(6+8)=n$ or $2\times14=n$.

The value of n is 28. Arthur's father needs 28 feet of fence for the flower bed that has the shape of a rectangle.

To find the perimeter of the triangle, you add the numbers. Why? The equation is $6+5+5=n$ or $6+(2\times5)=n$. What is the value of n?

Oral Tell how to find the perimeter in inches of the rectangle and the triangle below.





Written Follow these directions.

1. Find the perimeter of a rectangular room that is 10 feet wide and 15 feet long.

2. Find the perimeter in inches of a triangle that has dimensions as follows: 3 ft. 8 in., 2 ft. 9 in., and 2 ft. 9 in.

3. Find the cost of the fence for a rectangular yard that has dimensions of 50 ft. and 75 ft. The fence material costs $.48 a foot.

MORE PRACTICE PAGE 317

Read each problem carefully. Decide how to write it in equation form. Solve each equation. Read the problem again to see whether the answer seems sensible. Write the answer.

1. Walter made a bird feeder by cutting a piece of plywood 12 inches wide and 16 inches long. Then he planned to cut a strip of building paper to fasten around the outer edge of the plywood. How long should the strip be?

2. Sally saved $\frac{1}{5}$ of the money she earned. She earned $1.25 helping her father. How much of the money did she save?

3. Mrs. Davis bought 2 suits for her sons. Each suit cost $14.98, and the total tax on the suits was $.90. How much did she pay the clerk?

4. Mrs. Allen paid $6.98 for a dress for Barbara. The clerk gave Mrs. Allen $3.02 in change. How much money had Mrs. Allen given to the clerk?

5. A jet plane flew 1050 miles in 2 hours. What was its average speed per hour?

6. There are 8375 books in a school library. A year ago there were 7775 books in the library. How many more books are in the library this year than were in it last year?

7. In a recent election for mayor, Mr. Weiss received 4377 votes. Mr. Murray received 3856 votes. How many votes in all were cast for the two men?

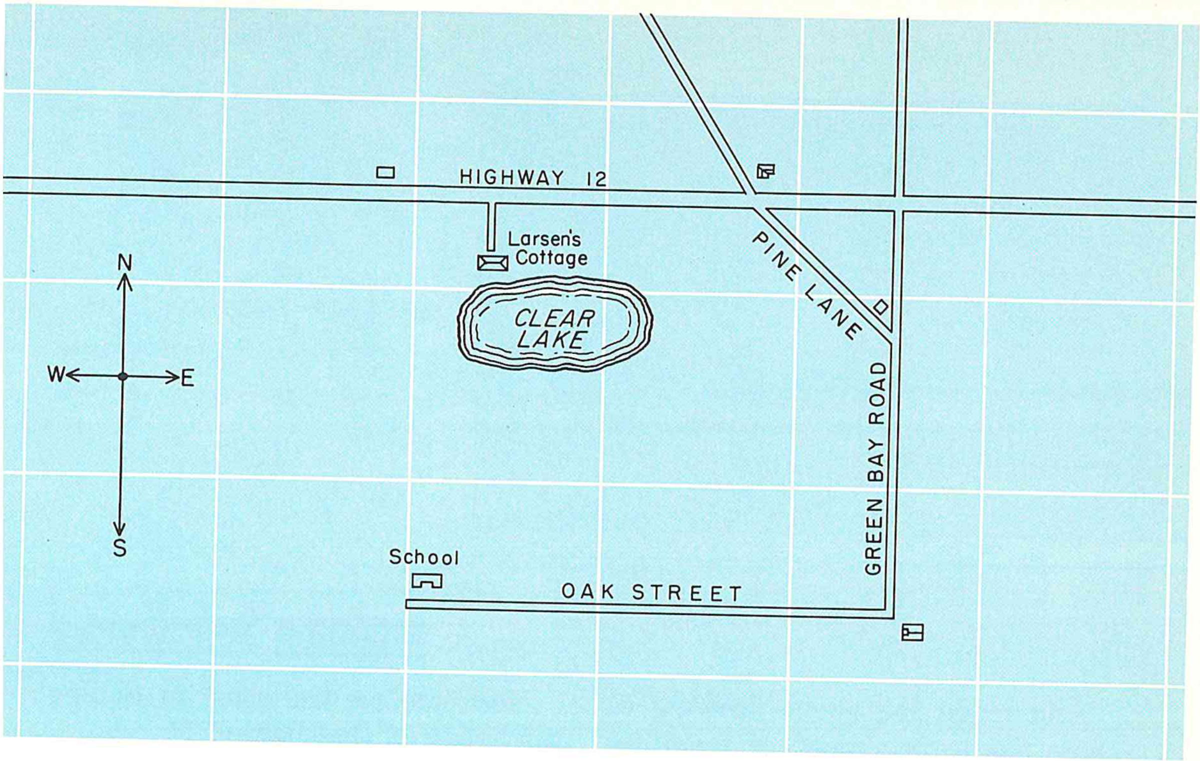
8. Mr. Walters made a garden in the shape of a triangle. Its dimensions were 10 feet by 9 feet by 9 feet. What was its perimeter?

9. Mr. Phillips wanted to build a fence around his back yard, which was square. The perimeter of the yard was 244 feet. What was the length of each of its four sides?

10. One week 135 bottles of milk were served in first grade, 163 bottles in second grade, 109 bottles in third grade, and 157 bottles in fourth grade. What was the average number of bottles of milk served in each grade?

11. The school store ordered spelling books for the fourth grade. If each book cost $1.18, how much would 29 spelling books cost?

12. Paul had saved $3.76, and his brother Randy had saved $4.02. The boys decided to give half their money to the Red Cross. How much did they give altogether?



Using a Map

Mrs. Larsen invited the fourth grade class to the Larsen's cottage on Clear Lake for a picnic. The map shows how to reach the cottage from the school. How long is each square on the map?

Each 1-inch length on the map represents a distance of 1 mile on the route.

Oral Use the above map to answer these questions.

1. On the map, how many inches represent the distance between the school and Green Bay Road? In miles, what is the actual distance?

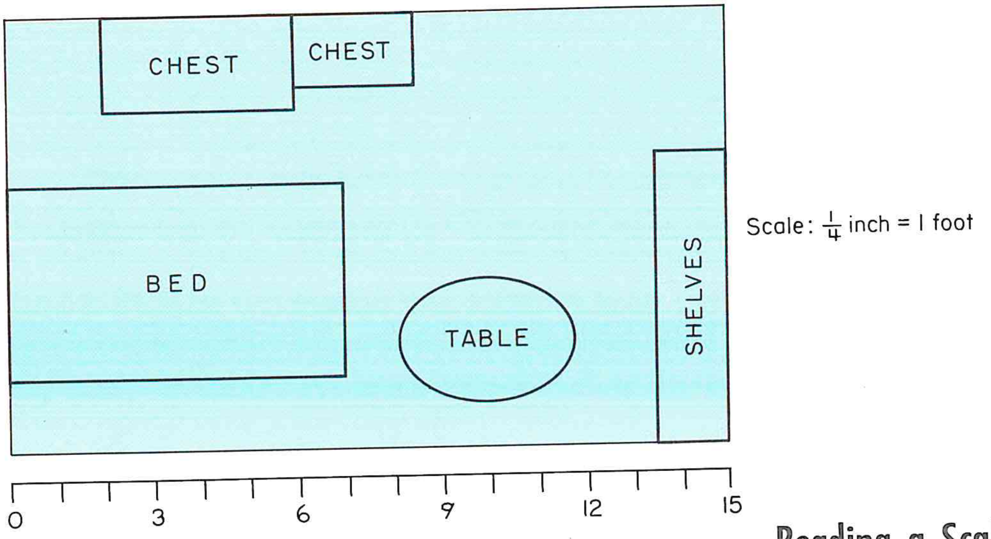
2. How far should a person travel on Green Bay Road before turning off?

3. How far should a person travel on Pine Lane? On Highway 12?

4. After turning off Highway 12, about how far should a person travel to get to the cottage?

5. About how long and how wide is Clear Lake?

6. How would you use a piece of string to help you find how many miles one would drive in going from the school to the Larsen's cottage?



Reading a Scale Drawing

Ann made the above drawing to show the arrangement of furniture in her room.

The drawing has the shape of the floor in her room. The pieces of furniture in the room are shown by the shape of the top of each piece. A length of $\frac{1}{4}$ inch on the drawing represents a length of 1 foot in the room. A drawing such as Ann's is called a **scale drawing.**

Ann has shown us how to use the scale in finding the length of the shelves.

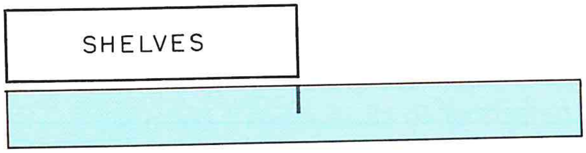
MORE PRACTICE PAGE 317

You can use the scale in finding the length of the shelves.

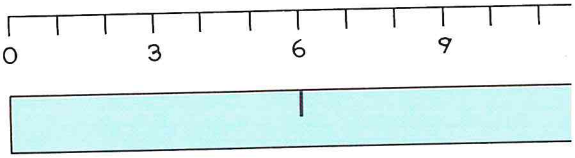
First, hold one edge of a strip of paper at one end of the drawing of the shelves, as in A below. Place a mark on the paper to coincide with the end of the drawing of the shelves.

Then lay your strip of paper on the scale, as in B. The end should coincide with the 0 mark on the scale. The mark on your paper should coincide with the mark on the scale that shows the length of the shelves. How long are the shelves?

A



B



Oral Answer these questions.

1. How would you use a strip of paper and the scale to find the width of the shelves?

2. How long is the bed? How wide is it?

3. How many inches longer is the bigger chest than the smaller chest?

4. What is the width of Ann's room?

5. How can you use the scale to find the length of the room?

6. If you had squared paper, how could you make a scale drawing of your classroom?

Written Write your answer to each question below.

1. What is the perimeter of the scale drawing of Ann's room?

2. What is the perimeter of Ann's room?

3. What is the length in inches of the 2 chests together?

4. What is the perimeter of the larger of the two chests?

5. How much longer are the shelves than the 2 chests together?

Solve these problems.

6. Betty looked at a map on which 1 inch represented a distance of 1 mile. Two cities on the map were $3\frac{1}{4}$ inches apart. How far apart were they in miles?

7. A distance of $\frac{1}{8}$ inch on a map represented a distance of 1 mile. James measured the map distance between two cities with his ruler. It was $1\frac{1}{4}$ inches. How far apart were the cities in miles?

8. The Browns' living room is 20 feet long and 14 feet wide. What is the perimeter of the room?

9. Using $\frac{1}{8}$ inch to represent one foot, Paul made a scale drawing of a room 12 feet long and 10 feet wide. What was the measurement of the drawing in inches?

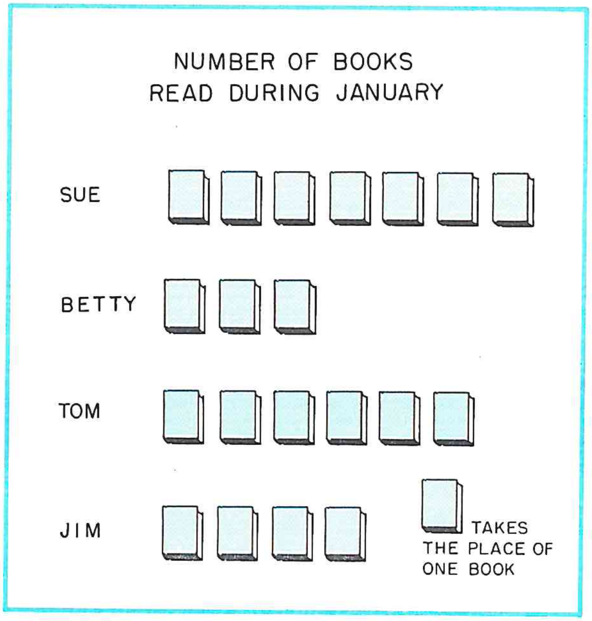
10. Tony rode his bicycle around a city block that was 660 feet long and 660 feet wide. How far did he ride his bicycle?

11. Terry's father pays $11.28 for his monthly ticket on the railroad. If he buys a ticket each month, how much does he pay for railroad tickets in a year?

12. A peck of oats weighs 8 pounds. Then how much do 375 bushels of oats weigh?

Something to do Use squared paper if you can get it. Make a scale drawing of your classroom or of some other room.

Reading a Pictograph



Sue kept a record of books which she and some of her friends read. Then she made the drawing you see above. A drawing like Sue's is called a **graph.** Because it is made by using pictures, it has the special name **pictograph.**

Oral Answer these questions about Sue's pictograph.

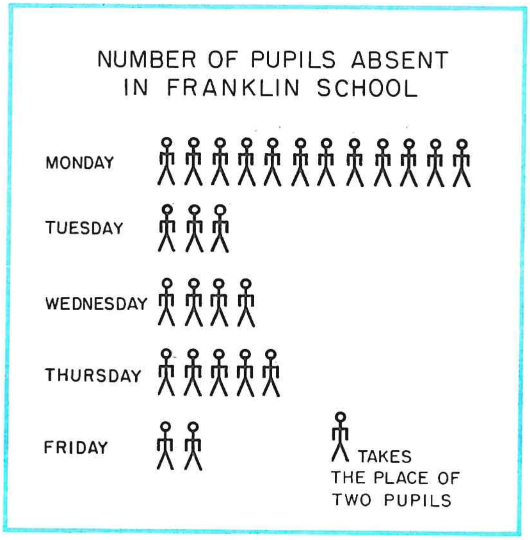
1. What is the name of Sue's pictograph?

2. Which row of pictures of books is longest?

3. Which row of pictures is the shortest?

4. How many books does each picture represent?

5. How many books did each pupil read?



Answer these questions about the pictograph above.

6. What is the name of the pictograph?

7. Which line of pictures is the longest?

8. How many pictures are drawn after the name of each of the days?

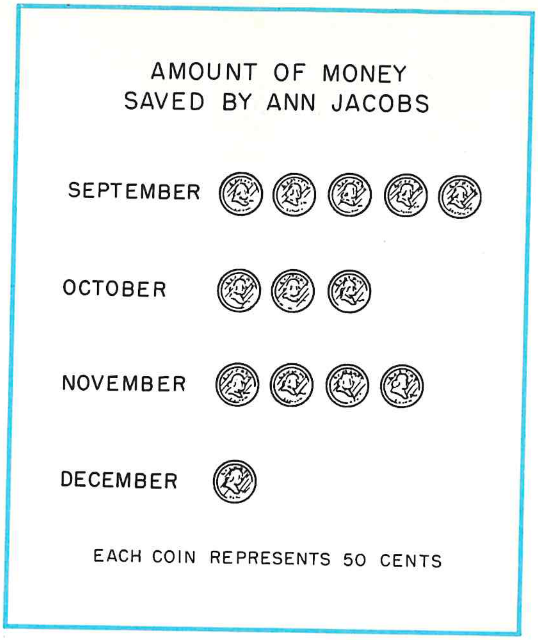
9. How many pupils were absent on each day?

Answer these questions about the pictograph at the top of page 259.

10. How many pictures of coins follow the name September?

11. How much money does each coin represent?

12. How much money did Ann save in September? In November?



Written Use the graphs on pages 258 and 259 for information you need in solving each problem below. You should not need pencil and paper to find the answer.

1. How many books in all were read in the month of January by Sue, Betty, Tom, and Jim?

2. How many times as many Franklin School pupils were absent on Monday than on Friday?

3. How many Franklin School pupils were absent on Monday and Tuesday together?

4. How many Franklin School pupils in all were absent during the week?

5. How much more money did Ann save in September than in October?

6. How much money did Ann save in the two months October and November?

7. How much money in all did Ann save in the 4 months?

Solve these problems.

8. On a pictograph where each picture of a boy represents 250 pupils, how many pupils are represented by a line of 8 pictures of boys?

9. On a pictograph where each picture of a man represents 25,000 people, how many people in all are represented by a line of 9 pictures of men?

10. On a pictograph where each picture of an apple represents 10 bushels of apples, how many bushels of apples are represented by a line of $15\frac{1}{2}$ apples?

Something to do Make a pictograph of your own. Using the figure ¢ to represent each nickel, show how many nickels Frank put in his nickel bank, if he saved the following amounts for seven weeks.

First week:	$.50
Second week:	.45
Third week:	.60
Fourth week:	.15
Fifth week:	.30
Sixth week:	.25
Seventh week:	.10

Reviewing Addition, Subtraction, Multiplication, and Division

Part 1 Copy. Find each sum. Check.

	a	*b*	*c*
1.	7657 965 3303 +2767	4760 6554 767 +9845	6975 438 9888 +4630
2.	5775 4646 9276 +8984	6988 3723 4554 +8467	5254 2923 4794 +8764
3.	8375 9058 5310 +8539	5405 2539 8339 +4000	4270 6608 9226 +3708
4.	9000 5300 8597 +6749	7007 7808 9069 +2480	3968 6695 5505 +4004

Part 2 Solve each equation. Write each difference. Check.

	a	*b*
1.	$4000 - n = 3568$	$6005 - 1989 = n$
2.	$n - 2494 = 2508$	$n - 3161 = 3839$
3.	$9624 - 3646 = n$	$3710 - n = 2741$
4.	$9526 - n = 4939$	$8418 - 2459 = n$
5.	$n - 5826 = 1784$	$n - 3937 = 8515$
6.	$7814 - n = 4889$	$n - 3646 = 5978$
7.	$9400 - 5646 = n$	$4903 - n = 1478$

Part 3 Solve each equation. Write the product. Check.

	a	*b*
1.	$2 \times n = 1092$	$n \times 9 = 2345$
2.	$n \times 7 = 4991$	$n \times 9 = 3870$
3.	$72 \times 912 = n$	$13 \times 965 = n$
4.	$50 \times 954 = n$	$62 \times 499 = n$
5.	$167 \times 432 = n$	$342 \times 941 = n$
6.	$322 \times 749 = n$	$233 \times 473 = n$
7.	$477 \times 843 = n$	$230 \times 828 = n$
8.	$500 \times 909 = n$	$802 \times 880 = n$

Part 4 Solve each equation. Write the quotient. Check.

	a	*b*
1.	$n \div 6 = 103$	$n \div 2 = 404$ r1
2.	$n \div 5 = 100$ r4	$n \div 7 = 103$
3.	$582 \div 6 = n$	$582 \div n = 6$
4.	$549 \div 3 = n$	$549 \div n = 3$
5.	$795 \div 6 = n$	$995 \div 7 = n$
6.	$9321 \div 3 = n$	$9021 \div n = 3$
7.	$8625 \div 6 = n$	$3902 \div n = 4$ r2
8.	$7658 \div 6 = n$	$8559 \div n = 9$
9.	$4793 \div n = 3$	$8508 \div 7 = n$

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. A circle, rectangle, and triangle each have a certain special shape. (247, 248, 249, 250)

2. The distance around a square, rectangle, or triangle is called its perimeter. (252)

3. A scale drawing of a place or of an object can be used to determine the size and shape of the place or object. (255, 256, 258)

Words to Know

1. Circle, square (247)

2. Right angles (247)

3. Rectangle, lines, and parallel lines (248)

4. Triangle (250)

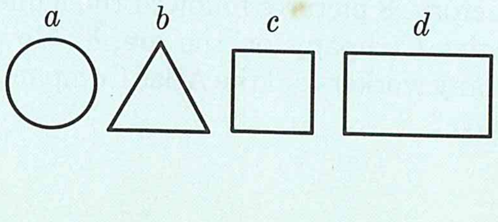
5. Perimeter (252)

6. Scale drawing (256)

7. Graph, pictograph (258)

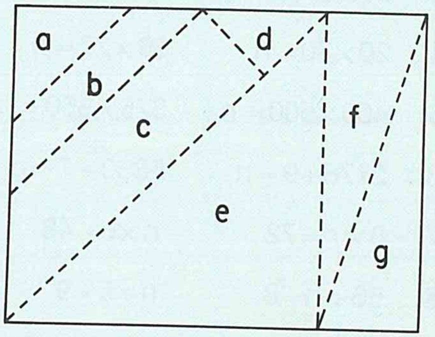
Questions to Discuss

1. What is the shape of each drawing below? (247, 248, 249)



2. How are parallel lines different from other pairs of lines you might draw? (248)

3. Which letters on the drawing below represent triangles? (250)



4. What are three ways to find the perimeter of the rectangle in question 3 above? (253)

Written Practice

Write an equation to use in following each direction below. Solve the equation. Write your answer.

1. Find the perimeter of a square with dimensions of 12 feet. (252)

2. Find the perimeter of a rectangle with dimensions of 11 inches and 15 inches. (253)

3. Find the perimeter of a triangle with these dimensions: 14 feet, 14 feet, and 14 feet. (253)

Self-Evaluation

Part 1 Copy. Solve each equation below.

	a	*b*
1.	$7257+8968=n$	$9764-5395=n$
2.	$5489+2750=n$	$7801-2765=n$
3.	$3\times4765=n$	$8\times2936=n$
4.	$20\times30=n$	$89\times27=n$
5.	$400\times500=n$	$375\times850=n$
6.	$2176\div9=n$	$5880\div7=n$
7.	$8\times n=72$	$n\times6=48$
8.	$56\div n=8$	$n\div5=9$

Part 2 Copy. Replace each blank with the missing numeral. The sign = is used to mean *is equivalent to.*

1. 10 ft. 5 in. = ___ in.

2. 5 yd. 2 ft. = ___ ft.

3. 1 mi. 1760 ft. = ___ ft.

4. 25 yd. = ___ in.

5. 12 ft. 9 in. = ___ in.

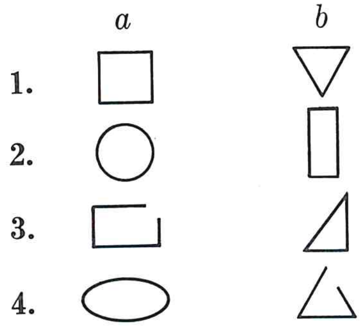
6. 15 yd. 2 ft. = ___ ft.

7. 2 mi. 125 yd. = ___ yd.

8. 5 mi. 1200 ft. = ___ ft.

9. 41 yd. 27 inches = ___ in.

Part 3 Write the numerals 1, 2, 3, and 4 on your paper. Then write *a* and *b* to head columns, as below. After each numeral and in the correct column, write the word *circle, square, rectangle,* or *triangle* for each drawing that one of the words describes.



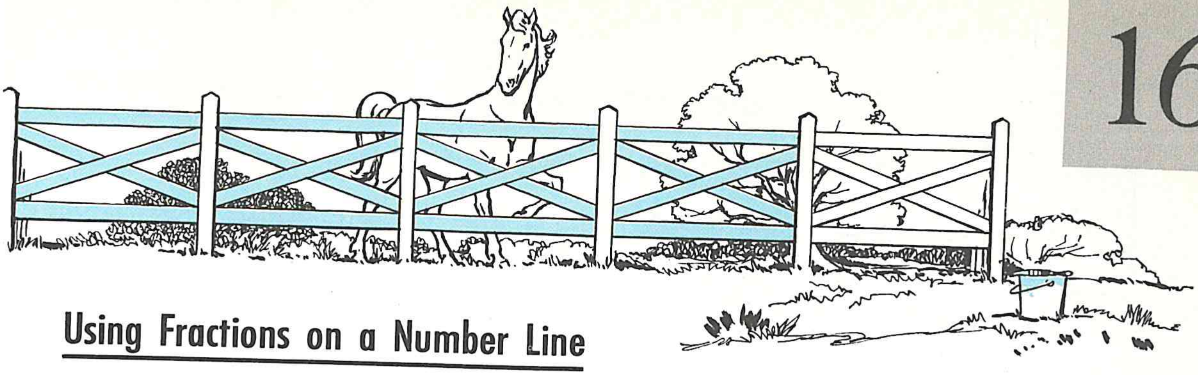
Part 4 Solve these problems.

1. Jan wants to put a border around a rectangular box with dimensions of 15 inches by 18 inches. How long will her border be?

2. John made a scale drawing on which $\frac{1}{2}$ inch represented a foot. He drew a line 2 inches long. How many feet did he represent?

3. On a pictograph, each drawing of a man represented 5 workers in a factory. 8 pictures followed the name Atlas Company on the graph. How many workers did the Atlas Company have?

16

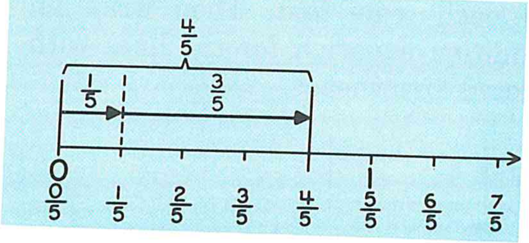


Using Fractions on a Number Line

Bob began at the left end of the fence. He painted $\frac{1}{5}$ of the fence. Then Roger began painting where Bob left off. Roger painted $\frac{3}{5}$ of the fence. What fractional part of the fence did the boys paint?

You are to think of the two different lengths as being joined; so you add the numbers. The equation is $\frac{1}{5}+\frac{3}{5}=n$.

You can use a diagram, as shown below, to help you *see* the value of n in the equation $\frac{1}{5}+\frac{3}{5}=n$.

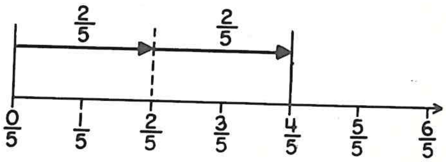


One arrow begins at 0. The point of the closed arrowhead shows where it ends. The second arrow begins at the end of the first one. Where does it end? The sum is read on the number line at the place where the second arrow ends. Does $\frac{1}{5}+\frac{3}{5}=\frac{4}{5}$?

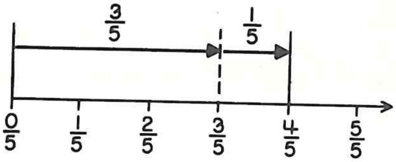
Together, the boys painted $\frac{4}{5}$ of the fence.

Oral Tell the equation that is shown in each diagram below.

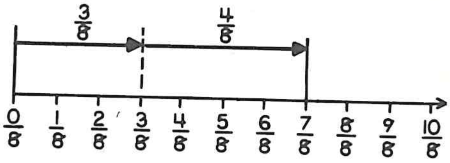
1.



2.



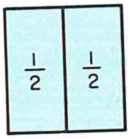
3.

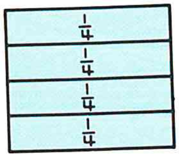


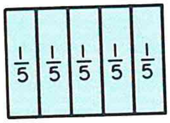
Something to do On your own paper draw number lines to represent each of the following equations.

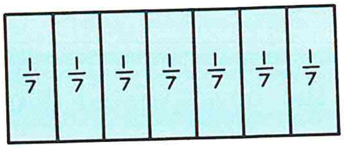
	a	*b*	*c*
1.	$\frac{1}{6}+\frac{4}{6}=\frac{5}{6}$	$\frac{2}{7}+\frac{5}{7}=\frac{7}{7}$	$\frac{4}{9}+\frac{0}{9}=\frac{4}{9}$
2.	$\frac{5}{10}+\frac{6}{10}=\frac{11}{10}$	$\frac{2}{11}+\frac{3}{11}=\frac{5}{11}$	$\frac{1}{12}+\frac{5}{12}=\frac{6}{12}$

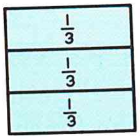
Using Fractions with a Common Denominator











You may remember that each fraction consists of two numerals, one above and the other below a fraction line. Suppose you wish to talk about only one of these numerals. You could call it the *top* numeral or you could call it the *bottom* numeral, but those words are not arithmetic language. The top numeral in a fraction is called the **numerator.** The bottom numeral in a fraction is called the **denominator.**

$\frac{2}{3}$

What is the numerator and the denominator in each fraction below?

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{1}{5}$ $\frac{2}{5}$

Now look at the following pairs of fractions. Are the denominators the same in each pair?

$\frac{1}{4}, \frac{3}{4}$ $\frac{1}{3}, \frac{2}{3}$ $\frac{3}{10}, \frac{9}{10}$ $\frac{3}{7}, \frac{2}{7}$

Fractions that have the same denominator are called **fractions with a common denominator.**

MORE PRACTICE PAGE 318

Oral Follow these directions.

1. Tell the numerator in each of these fractions: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{16}$.

2. Tell the denominator in each of these fractions: $\frac{5}{8}$, $\frac{7}{12}$, $\frac{15}{16}$.

3. Tell which pairs of fractions below have common denominators.

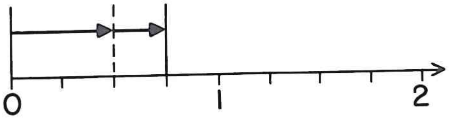
a	*b*	*c*
$\frac{2}{9}$ and $\frac{5}{9}$	$\frac{3}{4}$ and $\frac{5}{8}$	$\frac{2}{5}$ and $\frac{3}{5}$

Written Write only the pairs of fractions below that have common denominators.

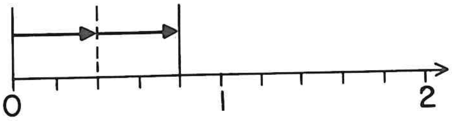
	a	*b*	*c*
1.	$\frac{2}{3}$ and $\frac{3}{4}$	$\frac{1}{5}$ and $\frac{4}{5}$	$\frac{1}{2}$ and $\frac{2}{3}$
2.	$\frac{1}{8}$ and $\frac{2}{4}$	$\frac{1}{7}$ and $\frac{1}{8}$	$\frac{3}{10}$ and $\frac{9}{10}$

Can you do this? Copy each diagram below. Fill out the fractions of each scale first. Then write an addition equation for the lines with closed arrowheads.

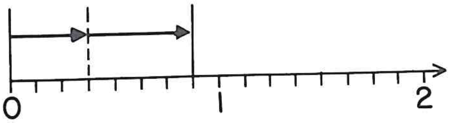
1.



2.

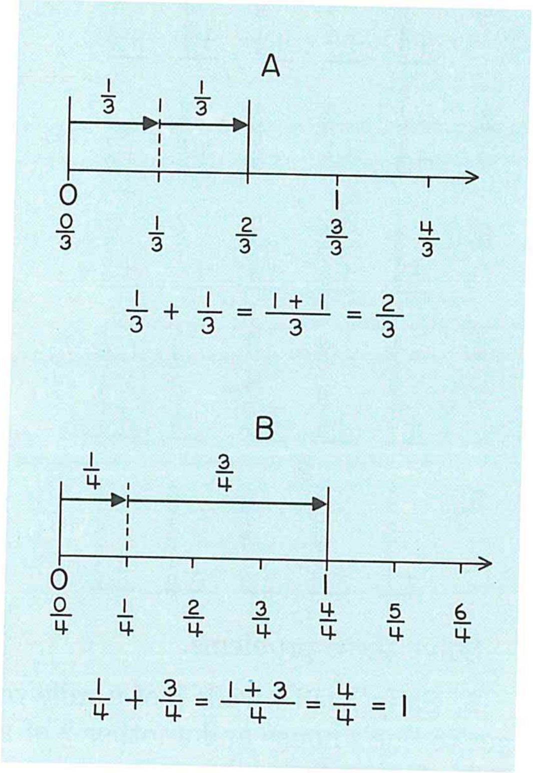


3.



Addition: Using Fractions with Common Denominators

Study the additions shown on the diagrams below.



$$\frac{1}{3} + \frac{1}{3} = \frac{1+1}{3} = \frac{2}{3}$$

$$\frac{1}{4} + \frac{3}{4} = \frac{1+3}{4} = \frac{4}{4} = 1$$

You add thirds in much the same way as you add ones.

$$\begin{array}{r}1 \text{ one}\\ +1 \text{ one}\\ \hline 2 \text{ ones}\end{array} \quad \begin{array}{r}1\\ +1\\ \hline 2\end{array} \qquad \begin{array}{r}1 \text{ third}\\ +1 \text{ third}\\ \hline 2 \text{ thirds}\end{array} \quad \begin{array}{r}\frac{1}{3}\\ +\frac{1}{3}\\ \hline \frac{2}{3}\end{array}$$

You add fourths in much the same way as you add ones.

$$\begin{array}{r}1 \text{ one}\\ +2 \text{ ones}\\ \hline 3 \text{ ones}\end{array} \quad \begin{array}{r}1\\ +2\\ \hline 3\end{array} \qquad \begin{array}{r}1 \text{ fourth}\\ +2 \text{ fourths}\\ \hline 3 \text{ fourths}\end{array} \quad \begin{array}{r}\frac{1}{4}\\ +\frac{2}{4}\\ \hline \frac{3}{4}\end{array}$$

Do you see how to add two numbers that are named by fractions which have common denominators? Add the numbers named by the numerators. Then write the sum over the common denominator.

Oral Read. Replace each n with the missing fraction.

	a	*b*	*c*
1.	$\frac{1}{3}+\frac{1}{3}=n$	$n+\frac{1}{3}=\frac{2}{3}$	$\frac{1}{3}+n=\frac{2}{3}$
2.	$\frac{2}{5}+\frac{1}{5}=n$	$\frac{2}{5}+n=\frac{3}{5}$	$n+\frac{1}{5}=\frac{3}{5}$
3.	$\frac{4}{9}+\frac{1}{9}=n$	$n+\frac{1}{9}=\frac{5}{9}$	$\frac{4}{9}+n=\frac{5}{9}$
4.	$\frac{2}{7}+\frac{1}{7}=n$	$\frac{2}{7}+n=\frac{3}{7}$	$n+\frac{1}{7}=\frac{3}{7}$
5.	$\frac{1}{9}+\frac{7}{9}=n$	$n+\frac{7}{9}=\frac{8}{9}$	$\frac{1}{9}+n=\frac{8}{9}$

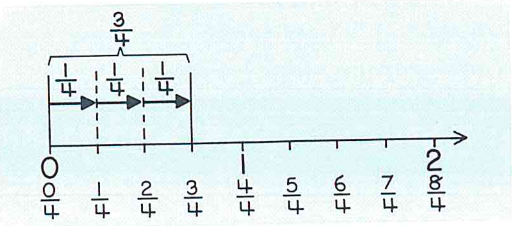
Written Copy. Write each sum.

	a	*b*	*c*	*d*	*e*
1.	$\begin{array}{r}\frac{1}{5}\\ +\frac{2}{5}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{3}\\ +\frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{5}\\ +\frac{1}{5}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{7}\\ +\frac{1}{7}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{4}\\ +\frac{1}{4}\\ \hline\end{array}$
2.	$\begin{array}{r}\frac{3}{7}\\ +\frac{2}{7}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{9}\\ +\frac{7}{9}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{4}\\ +\frac{2}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{6}\\ +\frac{4}{6}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{8}\\ +\frac{4}{8}\\ \hline\end{array}$
3.	$\begin{array}{r}\frac{1}{10}\\ +\frac{7}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{9}\\ +\frac{1}{9}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{11}\\ +\frac{7}{11}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{8}\\ +\frac{1}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{9}\\ +\frac{6}{9}\\ \hline\end{array}$
4.	$\begin{array}{r}\frac{1}{13}\\ +\frac{2}{13}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{15}\\ +\frac{9}{15}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{7}\\ +\frac{1}{7}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{10}\\ +\frac{8}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{9}{17}\\ +\frac{3}{17}\\ \hline\end{array}$
5.	$\begin{array}{r}\frac{1}{6}\\ +\frac{2}{6}\\ \hline\end{array}$	$\begin{array}{r}\frac{4}{8}\\ +\frac{2}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{14}\\ +\frac{11}{14}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{19}\\ +\frac{12}{19}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{11}\\ +\frac{5}{11}\\ \hline\end{array}$

MORE PRACTICE PAGE 318

Practice in Addition Using a Common Denominator

Suppose you are to find the sum of $\frac{1}{4}$ and $\frac{1}{4}$ and $\frac{1}{4}$. The diagram below shows one way to find it.



The number line shows you that $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{1+1+1}{4}=\frac{3}{4}$.

The sum $\frac{3}{4}$ is read at the point where the third arrow ends.

Now read each equation below.

$\frac{1}{7}+\frac{3}{7}+\frac{2}{7}=\frac{1+3+2}{7}=\frac{6}{7}$ $\qquad$ $\frac{2}{5}+\frac{1}{5}+\frac{1}{5}=\frac{2+1+1}{5}=\frac{4}{5}$

Do you see how to add three numbers named by fractions with a common denominator? Add the numbers named by the numerators and write the sum over the common denominator.

Oral Read. Replace n by a single fraction.

MORE PRACTICE PAGE 318

	a	*b*
1.	$\frac{1}{5}+\frac{1}{5}=n$	$n=\frac{1}{5}+\frac{3}{5}$
2.	$n=\frac{2}{5}+\frac{2}{5}$	$n=\frac{2}{7}+\frac{2}{7}$
3.	$n=\frac{1}{7}+\frac{1}{7}$	$\frac{2}{7}+n=\frac{3}{7}$
4.	$\frac{1}{9}+\frac{2}{9}+\frac{4}{9}=n$	$n+\frac{2}{9}+\frac{4}{9}=\frac{7}{9}$
5.	$n=\frac{2}{9}+\frac{2}{9}+\frac{4}{9}$	$\frac{8}{9}=\frac{2}{9}+n+\frac{4}{9}$

Written Copy. Write each sum.

	a	*b*	*c*	*d*	*e*
1.	$\frac{3}{7}+\frac{2}{7}$	$\frac{2}{7}+\frac{4}{7}$	$\frac{3}{5}+\frac{1}{5}$	$\frac{2}{7}+\frac{2}{7}$	$\frac{3}{7}+\frac{3}{7}$
2.	$\frac{1}{9}+\frac{1}{9}$	$\frac{4}{9}+\frac{1}{9}$	$\frac{1}{9}+\frac{7}{9}$	$\frac{2}{5}+\frac{1}{5}$	$\frac{2}{9}+\frac{2}{9}$
3.	$\frac{1}{3}+\frac{1}{3}$	$\frac{2}{5}+\frac{2}{5}$	$\frac{1}{7}+\frac{5}{7}$	$\frac{2}{8}+\frac{1}{8}$	$\frac{3}{6}+\frac{2}{6}$
4.	$\frac{1}{7}$ $\frac{3}{7}$ $+\frac{1}{7}$	$\frac{3}{8}$ $\frac{1}{8}$ $+\frac{1}{8}$	$\frac{4}{7}$ $\frac{1}{7}$ $+\frac{1}{7}$	$\frac{5}{9}$ $\frac{2}{9}$ $+\frac{1}{9}$	$\frac{1}{5}$ $\frac{1}{5}$ $+\frac{1}{5}$
5.	$\frac{3}{7}$ $\frac{2}{7}$ $+\frac{1}{7}$	$\frac{4}{9}$ $\frac{2}{9}$ $+\frac{2}{9}$	$\frac{1}{9}$ $\frac{5}{9}$ $+\frac{1}{9}$	$\frac{3}{8}$ $\frac{3}{8}$ $+\frac{1}{8}$	$\frac{1}{5}$ $\frac{2}{5}$ $+\frac{1}{5}$

Solve these problems.

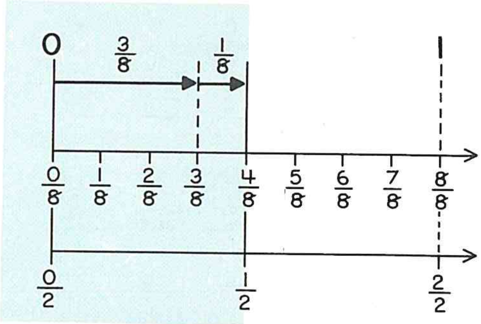
6. Sally has to walk $\frac{1}{5}$ of a mile to get to Sue's house and another $\frac{3}{5}$ of a mile from Sue's house to school. What fraction of a mile does she walk in all?

7. Mary bought $\frac{1}{3}$ of a yard of ribbon on Monday and $\frac{1}{3}$ of a yard on Tuesday. What fraction of a yard of ribbon did she buy altogether?

8. Tom spent $\frac{2}{5}$ of a dollar for a movie and $\frac{1}{5}$ of a dollar for a soda. What fraction of a dollar did he spend?

Changing Fractions to Lowest Terms

The addition of $\frac{3}{8}$ and $\frac{1}{8}$ is shown below.



The sum is $\frac{4}{8}$. $\frac{4}{8}$ of 1 equals $\frac{1}{2}$ of 1. $\frac{4}{8}$ and $\frac{1}{2}$ are different names, or forms, for the same number.

Look at the 1 and 2 of $\frac{1}{2}$. Are both 1 and 2 divisible by any number other than 1? They are not; so $\frac{1}{2}$ is in **lowest terms.** When $\frac{4}{8}$ is expressed as $\frac{1}{2}$ it is said to be *in lowest terms.*

What would happen to the value of $\frac{1}{2}$ if you were to multiply it by 1? $1\times\frac{1}{2}=\frac{1}{2}$ because multiplying a number by 1 doesn't change the number.

What are some other forms for 1? Did you think of $\frac{1}{1}$? $\frac{2}{2}$? $\frac{3}{3}$? $\frac{4}{4}$? There are many others. Choose $\frac{4}{4}$ for 1. Then: $\frac{1}{2}=1\times\frac{1}{2}=\frac{4}{4}\times\frac{1}{2}=\frac{4\times1}{4\times2}=\frac{4}{8}$.

Since you can multiply both the numerator and the denominator of a fraction by the same number without changing its value, you can also do the opposite. That is, you can divide both the numerator and the denominator by the same number. This is the same as dividing the fractional number by 1.

$\frac{4}{8}\div1=\frac{4}{8}$. Think of 1 as $\frac{4}{4}$.

Then: $\frac{4}{8}=\frac{4}{8}\div1=\frac{4}{8}\div\frac{4}{4}=\frac{4\div4}{8\div4}=\frac{1}{2}$.

How would you think of 1 if you were to change the form of $\frac{6}{9}$ to $\frac{2}{3}$? Of $\frac{9}{12}$ to $\frac{3}{4}$?

Oral Tell the steps used in changing each fraction to lowest terms.

1. $\frac{3}{12}=\frac{3}{12}\div1=\frac{3}{12}\div\frac{3}{3}=\frac{3\div3}{12\div3}=\frac{1}{4}$
2. $\frac{6}{8}=\frac{6}{8}\div1=\frac{6}{8}\div\frac{2}{2}=\frac{6\div2}{8\div2}=\frac{3}{4}$

Tell which of the fractions below are in lowest terms.

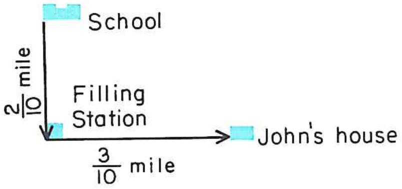
	a	*b*	*c*	*d*	*e*
3.	$\frac{3}{6}$	$\frac{3}{5}$	$\frac{3}{12}$	$\frac{3}{15}$	$\frac{3}{10}$
4.	$\frac{2}{5}$	$\frac{2}{10}$	$\frac{3}{8}$	$\frac{4}{16}$	$\frac{12}{16}$
5.	$\frac{6}{8}$	$\frac{3}{8}$	$\frac{9}{12}$	$\frac{1}{8}$	$\frac{5}{6}$

Written Write each fraction below in lowest terms.

	a	*b*	*c*	*d*	*e*
1.	$\frac{2}{8}$	$\frac{3}{9}$	$\frac{2}{4}$	$\frac{6}{8}$	$\frac{4}{6}$
2.	$\frac{4}{8}$	$\frac{3}{6}$	$\frac{6}{9}$	$\frac{3}{12}$	$\frac{8}{10}$
3.	$\frac{5}{10}$	$\frac{9}{12}$	$\frac{4}{16}$	$\frac{4}{10}$	$\frac{5}{15}$
4.	$\frac{8}{16}$	$\frac{4}{12}$	$\frac{2}{12}$	$\frac{8}{12}$	$\frac{6}{16}$

Changing Sums to Lowest Terms

John drew the following map to show a new friend how to get to his home from school. How far is John's house from school?



The equation is $\frac{2}{10}+\frac{3}{10}=n$. In equation form, it is solved as shown.

$$\frac{2}{10}+\frac{3}{10}=\frac{2+3}{10}=\frac{5}{10}=\frac{1}{2}$$

In column form the problem can be solved as shown. Are $\frac{5}{10}$ and $\frac{1}{2}$ different forms for the same number?

$$\begin{array}{r} \frac{2}{10} \\ +\frac{3}{10} \\ \hline \frac{5}{10}=\frac{1}{2} \end{array}$$

John's house is $\frac{1}{2}$ mile from school, if one follows the map John drew.

Oral Tell the steps taken in adding and in reducing the fractions in each sum in rows 1 through 6.

1. $\frac{3}{10}+\frac{3}{10}=\frac{3+3}{10}=\frac{6}{10}=\frac{3}{5}$
2. $\frac{5}{16}+\frac{5}{16}=\frac{5+5}{16}=\frac{10}{16}=\frac{5}{8}$
3. $\frac{3}{8}+\frac{1}{8}=\frac{3+1}{8}=\frac{4}{8}=\frac{1}{2}$
4. $\frac{2}{9}+\frac{4}{9}=\frac{2+4}{9}=\frac{6}{9}=\frac{2}{3}$
5. $\frac{3}{16}+\frac{1}{16}=\frac{3+1}{16}=\frac{4}{16}=\frac{1}{4}$
6. $\frac{1}{15}+\frac{4}{15}=\frac{1+4}{15}=\frac{5}{15}=\frac{1}{3}$

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Written Copy. Find each sum. Write each sum in lowest terms.

	a	b	c	d	e
1.	$\frac{1}{4}+\frac{1}{4}$	$\frac{1}{6}+\frac{1}{6}$	$\frac{1}{8}+\frac{1}{8}$	$\frac{5}{8}+\frac{1}{8}$	$\frac{3}{8}+\frac{3}{8}$
2.	$\frac{3}{16}+\frac{9}{16}$	$\frac{5}{12}+\frac{5}{12}$	$\frac{3}{16}+\frac{3}{16}$	$\frac{7}{10}+\frac{1}{10}$	$\frac{1}{12}+\frac{5}{12}$
3.	$\frac{3}{10}+\frac{1}{10}$	$\frac{1}{12}+\frac{1}{12}$	$\frac{3}{16}+\frac{7}{16}$	$\frac{1}{10}+\frac{1}{10}$	$\frac{1}{9}+\frac{5}{9}$

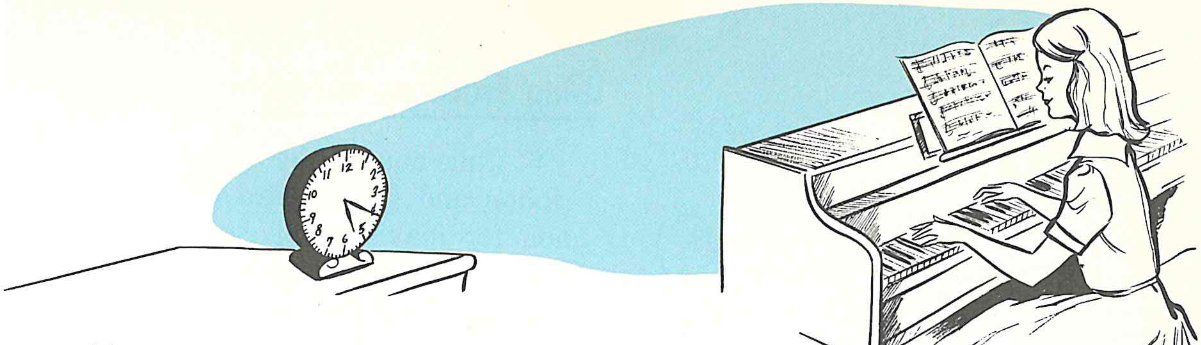
Copy each equation below. Solve it. Write the sum in lowest terms.

	a	b	c
4.	$\frac{1}{15}+\frac{8}{15}=n$	$\frac{3}{16}+\frac{5}{16}=n$	$\frac{5}{16}+\frac{7}{16}=n$
5.	$\frac{7}{20}+\frac{3}{20}=n$	$\frac{5}{16}+\frac{1}{16}=n$	$\frac{1}{15}+\frac{2}{15}=n$
6.	$\frac{1}{20}+\frac{3}{20}=n$	$\frac{5}{16}+\frac{9}{16}=n$	$\frac{7}{12}+\frac{1}{12}=n$

A quick review

	a	b
1.	$108\times560=n$	$n=273\times487$
2.	$365\times429=n$	$n=485\times584$

3. 16 yd. 2 ft. = ___ ft.
4. 2 T. 152 lb. = ___ lb.
5. 10 bu. 2 pk. = ___ pk.
6. $(50+2813+129)\div3=n$
7. $(983+212+1248)\times40=n$



Adding Fractional Numbers: Sums of One

Ann practiced on the piano for $\frac{1}{2}$ hour before school and $\frac{1}{2}$ hour after school. How many hours did Ann spend practicing on the piano?

You are to think of the half hours as being joined; so you add the fractional numbers. The equation is $\frac{1}{2}+\frac{1}{2}=n$. To solve it, add the numerators. Write the sum over the denominator as shown below.

$$\frac{1}{2}+\frac{1}{2}=\frac{1+1}{2}=\frac{2}{2}=1$$

You may remember that whenever the numerator and the denominator of a fraction are expressed by the same numeral, the fraction has a value of 1.

Ann practiced for 1 hour. You can find that $\frac{1}{2}$ hour added to $\frac{1}{2}$ hour is equivalent to 60 minutes. 30 minutes and 30 minutes are 60 minutes, or 1 hour.

Oral Follow these directions.

1. Tell which of these fractions have a value of 1: $\frac{3}{3}$, $\frac{4}{4}$, $\frac{4}{5}$, $\frac{5}{5}$, $\frac{5}{6}$, $\frac{6}{6}$.

2. Tell how you could show that $\frac{4}{4}$ hours are equal in value to 1 hour.

Written Copy. Solve each equation.

	a	*b*	*c*
1.	$\frac{1}{3}+\frac{2}{3}=n$	$n=\frac{3}{8}+\frac{5}{8}$	$\frac{3}{4}+\frac{1}{4}=n$
2.	$\frac{2}{5}+\frac{3}{5}=n$	$\frac{3}{10}+n=1$	$\frac{1}{6}+\frac{5}{6}=n$
3.	$\frac{1}{6}+n=1$	$n+\frac{5}{12}=1$	$n+\frac{3}{7}=1$

Copy. Write each sum. Reduce the fraction in each sum to lowest terms.

	a	*b*	*c*	*d*	*e*
4.	$\begin{array}{r}\frac{9}{16}\\+\frac{1}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{7}\\+\frac{1}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{9}\\+\frac{2}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{12}\\+\frac{1}{12}\\\hline\end{array}$	$\begin{array}{r}\frac{2}{15}\\+\frac{8}{15}\\\hline\end{array}$
5.	$\begin{array}{r}\frac{5}{12}\\\frac{5}{12}\\+\frac{1}{12}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{16}\\\frac{3}{16}\\+\frac{3}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{4}{9}\\\frac{1}{9}\\+\frac{4}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{1}{5}\\\frac{2}{5}\\+\frac{1}{5}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{17}\\\frac{2}{17}\\+\frac{5}{17}\\\hline\end{array}$

Copy and solve each equation below.

	a	*b*
6.	$\frac{6}{20}+\frac{3}{20}+\frac{7}{20}=n$	$\frac{7}{16}+\frac{3}{16}+\frac{3}{16}=n$
7.	$\frac{1}{15}+\frac{7}{15}+\frac{7}{15}=n$	$\frac{7}{25}+\frac{4}{25}+\frac{14}{25}=n$

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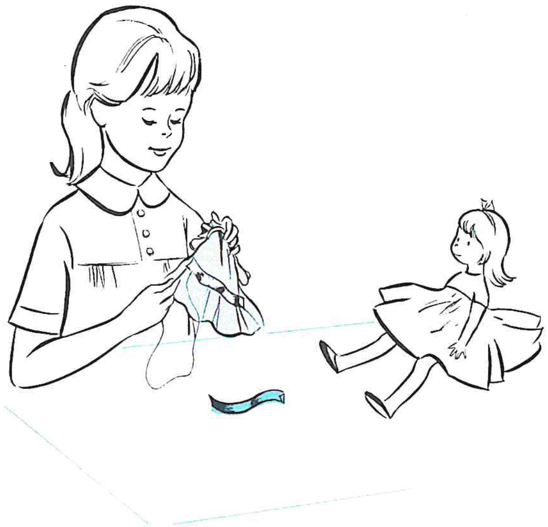


Using Fractions in Solving Problems

Read each problem carefully. Write the equation you would use in finding the answer. Solve the equation. Write the answer.

1. Jerry wants to nail a strip of wood $\frac{3}{8}$ of an inch thick to a piece of plywood $\frac{3}{8}$ of an inch thick. How long a nail would be equal to the thickness of the two boards together?

2. John's mother bought $\frac{1}{2}$ dozen large oranges and $\frac{1}{2}$ dozen small oranges. How many dozen oranges did she buy?

3. Jane studied $\frac{1}{4}$ of an hour in the afternoon and $\frac{3}{4}$ of an hour in the evening. How many hours did she study that day?

4. Nancy's mother used $\frac{2}{3}$ of a cup of white flour and $\frac{1}{3}$ of a cup of whole-wheat flour for making cookies. How many cups of flour did she use in all?

5. Julie bought $\frac{1}{6}$ of a yard of white ribbon and $\frac{1}{6}$ of a yard of blue ribbon for making doll clothes. What part of a yard of ribbon did she buy altogether?

6. Doris walked $\frac{3}{4}$ of a mile to Betty's house and $\frac{1}{4}$ of a mile from Betty's house to Ruth's house. How many miles did she walk?

7. Bob practiced his violin lesson $\frac{1}{3}$ of an hour in the morning and $\frac{1}{3}$ of an hour in the afternoon. What part of an hour did he practice that day?

8. Tom cut off a piece of felt $\frac{5}{16}$ of an inch long, and another piece $\frac{7}{16}$ of an inch long, to use in making two small letters. What part of an inch of felt did he use in all?

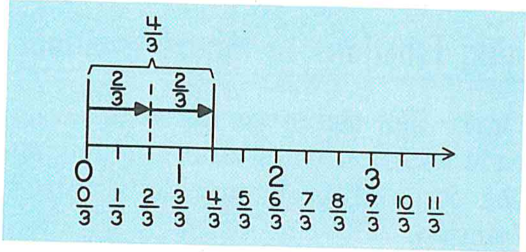
9. Tom bought a model airplane kit. He spent $\frac{1}{4}$ of an hour reading the directions and $\frac{3}{4}$ of an hour assembling the parts. How much time did he spend altogether?

10. Hugh bought $\frac{1}{4}$ of a pound of candy, and Jack bought $\frac{1}{4}$ of a pound. What part of a pound of candy did the two boys buy altogether?

11. The $\frac{1}{4}$ of a pound of candy Hugh bought cost 40¢ a pound. The $\frac{1}{4}$ of a pound Jack bought cost 32¢ a pound. How much did each pay? How much did they pay altogether?

Changing the Form of Improper Fractions

Suppose you are to add $\frac{2}{3}$ to $\frac{2}{3}$. The diagram below shows what you might do.

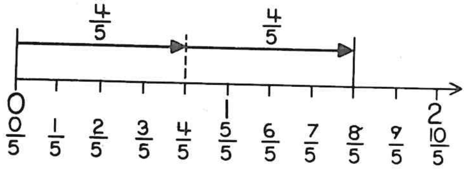

$\frac{4}{3}$
$\frac{2}{3}$
$\frac{2}{3}$
0
1
2
3
$\frac{0}{3}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{3}{3}$ $\frac{4}{3}$ $\frac{5}{3}$ $\frac{6}{3}$ $\frac{7}{3}$ $\frac{8}{3}$ $\frac{9}{3}$ $\frac{10}{3}$ $\frac{11}{3}$

Read the sum $\frac{4}{3}$ from the number line at the place where the second arrow ends. $\frac{2}{3}+\frac{2}{3}=\frac{2+2}{3}=\frac{4}{3}$.

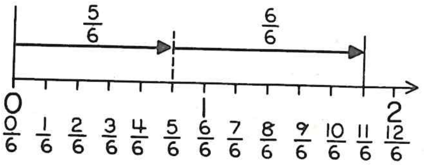
$\frac{4}{3}$ is called an *improper fraction.* Any fraction in which the numerator is greater than the denominator is called an improper fraction. An improper fraction can be expressed in a different form. $\frac{4}{3}=\frac{3+1}{3}=\frac{3}{3}+\frac{1}{3}=1+\frac{1}{3}=1\frac{1}{3}$. This numeral is a *mixed fraction.*

Oral Tell which equation is shown by each drawing below. Tell how you would express each sum.

1.


$\frac{4}{5}$
$\frac{4}{5}$
0
1
2
$\frac{0}{5}$ $\frac{1}{5}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{4}{5}$ $\frac{5}{5}$ $\frac{6}{5}$ $\frac{7}{5}$ $\frac{8}{5}$ $\frac{9}{5}$ $\frac{10}{5}$

2.


$\frac{5}{6}$
$\frac{6}{6}$
0
1
2
$\frac{0}{6}$ $\frac{1}{6}$ $\frac{2}{6}$ $\frac{3}{6}$ $\frac{4}{6}$ $\frac{5}{6}$ $\frac{6}{6}$ $\frac{7}{6}$ $\frac{8}{6}$ $\frac{9}{6}$ $\frac{10}{6}$ $\frac{11}{6}$ $\frac{12}{6}$

Tell the steps you would take in changing the form of each improper fraction below to a mixed fraction.

	a	*b*	*c*	*d*	*e*
3.	$\frac{3}{2}$	$\frac{11}{9}$	$\frac{11}{8}$	$\frac{11}{7}$	$\frac{8}{7}$
4.	$\frac{9}{7}$	$\frac{5}{3}$	$\frac{9}{5}$	$\frac{7}{5}$	$\frac{10}{9}$

Written Copy. Write each sum as a mixed fraction.

	a	*b*	*c*
1.	$\frac{2}{3}+\frac{2}{3}=n$	$\frac{3}{5}+\frac{4}{5}=n$	$\frac{4}{5}+\frac{4}{5}=n$
2.	$\frac{6}{7}+\frac{4}{7}=n$	$\frac{5}{7}+\frac{6}{7}=n$	$\frac{3}{7}+\frac{5}{7}=n$
3.	$\frac{7}{9}+\frac{4}{9}=n$	$\frac{7}{9}+\frac{7}{9}=n$	$\frac{2}{5}+\frac{4}{5}=n$

Copy. Write each sum below as a mixed fraction.

	a	*b*	*c*	*d*	*e*
4.	$\begin{array}{r}\frac{4}{7}\\+\frac{5}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{6}{7}\\+\frac{6}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{9}\\+\frac{8}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{9}\\+\frac{8}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{8}\\+\frac{7}{8}\\\hline\end{array}$
5.	$\begin{array}{r}\frac{6}{7}\\+\frac{2}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{9}\\+\frac{2}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{5}\\+\frac{3}{5}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{7}\\+\frac{5}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{11}\\+\frac{7}{11}\\\hline\end{array}$

Solve these problems.

6. Jean bought 2 remnants of material. One was $\frac{5}{8}$ yd.; the other was $\frac{3}{8}$ yd. How much material did Jean buy?

7. Bob rode his bicycle $\frac{3}{5}$ of a mile to the post office and then $\frac{4}{5}$ of a mile to school. How far did he ride altogether?

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$$\frac{5}{6}+\frac{5}{6}=\frac{5+5}{6}=\frac{10}{6}=\frac{10\div 2}{6\div 2}=\frac{5}{3}=\frac{3+2}{3}=\frac{3}{3}+\frac{2}{3}=1+\frac{2}{3}=1\frac{2}{3}$$

$$\frac{4}{9}+\frac{8}{9}=\frac{4+8}{9}=\frac{12}{9}=\frac{12\div 3}{9\div 3}=\frac{4}{3}=\frac{3+1}{3}=\frac{3}{3}+\frac{1}{3}=1+\frac{1}{3}=1\frac{1}{3}$$

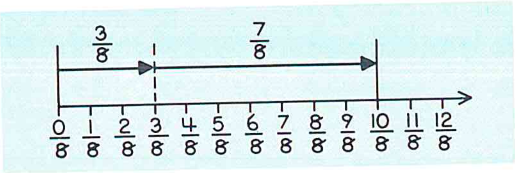
$$\frac{7}{10}+\frac{7}{10}=\frac{7+7}{10}=\frac{14}{10}=\frac{14\div 2}{10\div 2}=\frac{7}{5}=\frac{5+2}{5}=\frac{5}{5}+\frac{2}{5}=1+\frac{2}{5}=1\frac{2}{5}$$

Changing Fractions to Mixed Fractions

Bob made a top for a workbench by nailing a piece of plywood $\frac{3}{8}$ of an inch thick to a board that was $\frac{7}{8}$ of an inch thick. What was the thickness of the top of the bench?

You are to think of the boards as fastened together; so you add the numbers that give the thickness of each board. The equation is $\frac{3}{8}+\frac{7}{8}=n$.

Look at the way it is solved on the number line.



Read the sum from the number line at the place where the second arrow ends. $\frac{3}{8}+\frac{7}{8}=\frac{3+7}{8}=\frac{10}{8}$.

$\frac{10}{8}$ can be expressed in a different form, because both 10 and 8 are divisible by 2. Thus $\frac{10}{8}$ becomes $\frac{5}{4}$. $\frac{5}{4}$ is an improper fraction. It can be expressed as $1+\frac{1}{4}$ or as $1\frac{1}{4}$.

The top of the workbench was $1\frac{1}{4}$ inches thick.

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Oral Tell the steps taken in doing each addition below and in changing the form of each sum to a mixed fraction.

1. $\frac{4}{7}+\frac{5}{7}=\frac{4+5}{7}=\frac{9}{7}=1\frac{2}{7}$
2. $\frac{4}{5}+\frac{4}{5}=\frac{4+4}{5}=\frac{8}{5}=1\frac{3}{5}$
3. $\frac{7}{8}+\frac{5}{8}=\frac{7+5}{8}=\frac{12}{8}=1\frac{4}{8}=1\frac{1}{2}$

Written Copy. Solve each equation. Check.

	a	*b*
1.	$\frac{5}{8}+\frac{7}{8}=n$	$\frac{8}{9}+\frac{7}{9}=n$
2.	$\frac{7}{9}+\frac{5}{9}=n$	$\frac{9}{10}+\frac{7}{10}=n$
3.	$\frac{7}{8}+\frac{7}{8}=n$	$\frac{11}{12}+\frac{5}{12}=n$
4.	$\frac{11}{12}+\frac{7}{12}=n$	$\frac{9}{10}+\frac{9}{10}=n$
5.	$\frac{7}{16}+\frac{11}{16}=n$	$\frac{4}{15}+\frac{14}{15}=n$
6.	$\frac{9}{16}+\frac{9}{16}=n$	$\frac{3}{10}+\frac{9}{10}=n$
7.	$\frac{9}{16}+\frac{11}{16}=n$	$\frac{5}{16}+\frac{13}{16}=n$

Write the above in column form and add. Compare your answers with those obtained in the equation form. They should be the same.

Solving Problems

Read each problem carefully. Write the equation to use in solving each one.

Reminders:

a. Use either addition or multiplication if you want to find how many in all.

b. Use subtraction to find how many left or to find by how many the number of one set differs from that of another.

c. Use division if you want to find how many in each group or to find how many groups of equal size.

1. Doris walked $\frac{5}{8}$ of a mile in going from her home to school. Coming home by a longer route, she walked $\frac{7}{8}$ of a mile. How far did she walk altogether?

2. Robert spent $\frac{3}{4}$ of an hour reading a book before lunch, and he spent $\frac{1}{4}$ of an hour reading it after lunch. How much time did Robert spend in reading the book?

3. The streamliner traveled at an average speed of 64 miles an hour for 11 hours. How far did the streamliner travel?

4. The cost of a picnic for 6 girls was $4.50. What was each girl's share of the cost?

5. John put 135 pounds of potatoes into bags which held 5 pounds each. How many bags did John fill?

6. Last year Mr. Evans harvested 1108 bushels of pears. He estimates this year's crop at 1436 bushels. How much larger than last year's crop does he expect this year's crop to be?

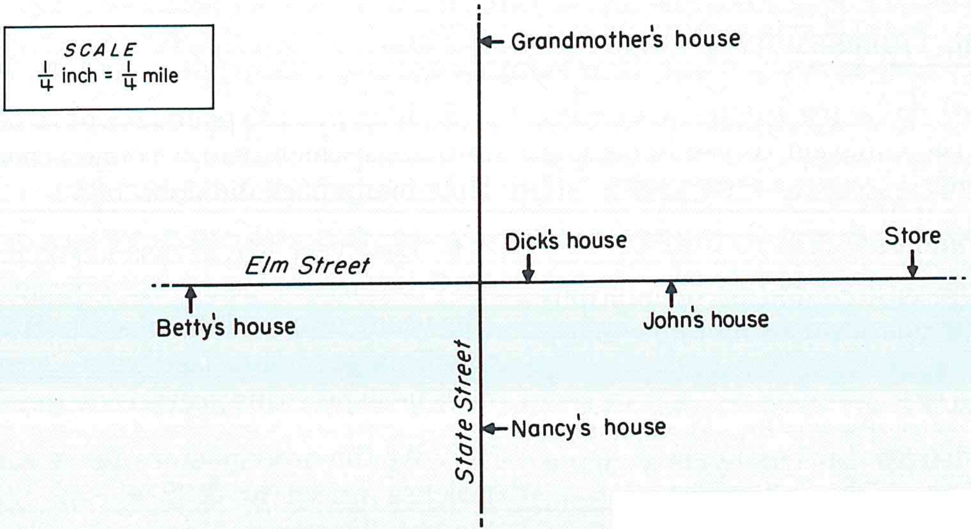
7. At the grocery store Betty saw peaches priced at $.32 a can. She bought 9 cans and gave the clerk $5.00. How much change should she receive?

8. Nancy practiced her piano lesson for 30 minutes on Thursday, 40 minutes on Friday, 40 minutes on Saturday, and 30 minutes on Monday. What was the average number of minutes she practiced each day?

9. Each of 3 loads of coal weighed as follows: 3275 lb., 3500 lb., 3250 lb. What was the total weight?

Oral Tell what equation you would use to solve each of the above problems and why you decided on each equation.

Written Write an equation for each problem above. Solve each equation. Read the problem again to see if your answer is sensible. Then write the answer.



Using Fractions on a Map

The above map shows the homes of some children and their grandmother. Each $\frac{1}{4}$ inch on the map stands for a distance of $\frac{1}{4}$ mile. Use your ruler to help you answer the questions below.

1. How many inches on the map represent the distance between Nancy's house and Elm Street? Between Betty's house and State Street?

2. How many $\frac{1}{4}$ inches on the map represent the distance Betty must ride her bicycle in going from her home to Nancy's home, if she rides along Elm Street and then along State Street?

3. How many $\frac{1}{4}$ inches on the map represent the distance Nancy rides in going to her grandmother's house and then home again?

4. What is the distance in miles between John's house and Dick's house? Between John's house and Betty's?

5. If Nancy rides to her grandmother's house and then to Betty's house, how many miles will she ride?

6. How many $\frac{1}{4}$ inches on the map represent the distance John must ride his bicycle in going from his grandmother's house to his home, if he rides down State Street and then down Elm Street?

Something to do Using the above map to guide you, draw a map of your own to scale. Let your map show how to get from your home to school, to the library, or to some other point. Indicate the distances on your map, and show what scale you have used.

A	B	C
$\begin{array}{r} \frac{1}{3} \\ +4\frac{1}{3} \\ \hline 4\frac{2}{3} \end{array}$	$\begin{array}{r} 5\frac{1}{4} \\ +\frac{1}{4} \\ \hline 5\frac{2}{4} = 5\frac{1}{2} \end{array}$	$\begin{array}{r} 9\frac{1}{2} \\ +\frac{1}{2} \\ \hline 9\frac{2}{2} = 9+1=10 \end{array}$

Mixed Fractions in Column Addition

You are likely to use the column form when you add numbers named by mixed fractions. First, add the fractional numbers and then add the whole numbers.

Oral Study the examples at the top of this page. Answer the questions below.

1. In A, how do you know that the sum is in lowest terms?

2. What was done to change the sum in B to lowest terms?

3. Why is the sum in C a whole number?

Written Copy. Write each sum.

	a	*b*	*c*	*d*
1.	$6\frac{2}{7} + \frac{3}{7}$	$3\frac{3}{5} + \frac{1}{5}$	$4\frac{2}{9} + \frac{2}{9}$	$\frac{2}{7} + 8\frac{1}{7}$
2.	$9\frac{1}{5} + \frac{2}{5}$	$7\frac{5}{9} + \frac{2}{9}$	$4\frac{1}{7} + \frac{4}{7}$	$1\frac{1}{9} + \frac{4}{9}$
3.	$7\frac{5}{8} + \frac{1}{8}$	$6\frac{1}{10} + \frac{1}{10}$	$\frac{3}{8} + 1\frac{3}{8}$	$4\frac{1}{10} + \frac{3}{10}$
4.	$5\frac{1}{9} + \frac{3}{9}$	$3\frac{1}{8} + \frac{7}{8}$	$8\frac{1}{9} + \frac{4}{9}$	$2\frac{1}{7} + \frac{1}{7}$
5.	$8\frac{3}{5} + \frac{2}{5}$	$7\frac{7}{10} + \frac{3}{10}$	$4\frac{5}{8} + \frac{3}{8}$	$\frac{8}{9} + 2\frac{1}{9}$
6.	$2\frac{4}{7} + \frac{3}{7}$	$4\frac{1}{6} + \frac{5}{6}$	$9\frac{3}{4} + \frac{1}{4}$	$5\frac{1}{3} + \frac{2}{3}$
7.	$9\frac{1}{7} + \frac{6}{7}$	$7\frac{2}{9} + \frac{7}{9}$	$3\frac{5}{9} + \frac{4}{9}$	$\frac{4}{5} + 7\frac{1}{5}$
8.	$3\frac{7}{9} + \frac{1}{9}$	$8\frac{4}{5} + \frac{1}{5}$	$2\frac{1}{3} + \frac{1}{3}$	$6\frac{4}{7} + \frac{1}{7}$
9.	$1\frac{1}{5} + \frac{4}{5}$	$1\frac{1}{4} + \frac{1}{4}$	$\frac{2}{10} + 4\frac{7}{10}$	$3\frac{2}{9} + \frac{2}{9}$
10.	$8\frac{3}{10} + \frac{3}{10}$	$4\frac{1}{8} + \frac{1}{8}$	$\frac{4}{9} + 7\frac{4}{9}$	$\frac{1}{4} + 3\frac{1}{4}$

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Practice in Writing Sums in Simplest Form

John and his father need a board $4\frac{7}{8}$ inches wide and a strip $\frac{5}{8}$ of an inch wide. Can they cut the board and the strip from a board that is 6 inches wide?

You must first know the total width of the board and the strip; so you add the numbers. The equation is $4\frac{7}{8}+\frac{5}{8}=n$. The equation may be solved as shown.

$$4\frac{7}{8}+\frac{5}{8}=4+\left(\frac{7}{8}+\frac{5}{8}\right)=4+\frac{7+5}{8}=4+\frac{12}{8}$$

$$4+\frac{12}{8}=4+\frac{3}{2}=(4+1)+\frac{1}{2}=5+\frac{1}{2}=5\frac{1}{2}$$

In column form, the equation is solved as shown below.

$$\begin{array}{l} \;\;4\frac{7}{8}\\ \underline{+\;\frac{5}{8}}\\ \;\;4\frac{12}{8}=4+1\frac{4}{8}=5\frac{4}{8}=5\frac{1}{2}\end{array}$$

John and his father will use $5\frac{1}{2}$ inches of the 6-inch board.

Now study the addition below. What steps were taken in changing the form of the answer?

$$\begin{array}{l} \;\;\frac{1}{4}\\ \;\;5\frac{2}{4}\\ \underline{+\;\frac{3}{4}}\\ \;\;5\frac{6}{4}=5+1\frac{2}{4}=6\frac{2}{4}=6\frac{1}{2}\end{array}$$

A mixed fraction is said to be in **simplest form** when the numerator of the fraction is less than the denominator and when the fraction is in lowest terms.

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Oral Tell the steps you would use in changing each mixed fraction below to simplest form.

	a	*b*	*c*	*d*
1.	$7\frac{3}{2}$	$5\frac{4}{3}$	$8\frac{11}{6}$	$9\frac{6}{5}$
2.	$6\frac{13}{10}$	$8\frac{13}{9}$	$3\frac{11}{8}$	$5\frac{8}{5}$
3.	$5\frac{10}{8}$	$8\frac{12}{10}$	$2\frac{6}{4}$	$1\frac{13}{8}$
4.	$3\frac{16}{10}$	$8\frac{18}{16}$	$4\frac{12}{9}$	$7\frac{10}{7}$

Written Copy. Write each sum.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}\frac{3}{10}\\ \underline{+6\frac{9}{10}}\end{array}$	$\begin{array}{r}\frac{7}{15}\\ \underline{+3\frac{11}{15}}\end{array}$	$\begin{array}{r}8\frac{3}{4}\\ \underline{+\frac{3}{4}}\end{array}$	$\begin{array}{r}\frac{15}{16}\\ \underline{+2\frac{5}{16}}\end{array}$
2.	$\begin{array}{r}3\frac{5}{9}\\ \frac{4}{9}\\ \underline{+\frac{2}{9}}\end{array}$	$\begin{array}{r}7\frac{1}{12}\\ \frac{5}{12}\\ \underline{+\frac{7}{12}}\end{array}$	$\begin{array}{r}\frac{3}{8}\\ 2\frac{3}{8}\\ \underline{+\frac{5}{8}}\end{array}$	$\begin{array}{r}\frac{3}{7}\\ \frac{2}{7}\\ \underline{+4\frac{5}{7}}\end{array}$
3.	$\begin{array}{r}5\frac{7}{10}\\ \frac{3}{10}\\ \underline{+\frac{7}{10}}\end{array}$	$\begin{array}{r}8\frac{3}{5}\\ \frac{2}{5}\\ \underline{+\frac{3}{5}}\end{array}$	$\begin{array}{r}4\frac{1}{6}\\ \frac{5}{6}\\ \underline{+\frac{1}{6}}\end{array}$	$\begin{array}{r}2\frac{1}{3}\\ \frac{1}{3}\\ \underline{+\frac{2}{3}}\end{array}$

Copy and solve each equation below. Write each sum in simplest form.

	a	*b*
4.	$\frac{7}{8}+2\frac{7}{8}=n$	$3\frac{5}{9}+\frac{7}{9}=n$
5.	$\frac{5}{8}+6\frac{5}{8}=n$	$1\frac{7}{8}+\frac{5}{8}=n$
6.	$15\frac{7}{10}+\frac{9}{10}=n$	$\frac{9}{16}+7\frac{9}{16}=n$
7.	$4\frac{9}{10}+\frac{9}{10}=n$	$1\frac{13}{15}+\frac{7}{15}=n$

Mixed Fractions in Addition

The example below shows all of the steps taken in adding $2\frac{7}{8}$ to $2\frac{5}{8}$.

$$\begin{array}{r} 2\frac{5}{8} \\ +2\frac{7}{8} \\ \hline 4\frac{12}{8} \end{array} = 4+1\frac{4}{8}=5\frac{4}{8}=5\frac{1}{2}$$

In the above, first the fractional numbers were added. Then the ones were added. What steps were taken in changing the form of $4\frac{12}{8}$ to $5\frac{1}{2}$?

$$\begin{aligned} 3\frac{5}{7}+4\frac{3}{7} &= \left(3+\frac{5}{7}\right)+\left(4+\frac{3}{7}\right) \\ &= (3+4)+\left(\frac{5}{7}+\frac{3}{7}\right) \\ &= 7+\frac{5+3}{7} \\ &= 7+\frac{8}{7} \\ &= (7+1)+\frac{1}{7} \\ &= 8+\frac{1}{7} \\ &= 8\frac{1}{7} \end{aligned}$$

Oral Tell the steps you would take in solving each equation below.

	a	*b*
1.	$5\frac{1}{3}+3\frac{1}{3}=n$	$7\frac{1}{4}+8\frac{1}{4}=n$
2.	$3\frac{2}{5}+4\frac{1}{5}+6\frac{2}{5}=n$	$7\frac{3}{4}+6\frac{1}{4}+5\frac{1}{4}=n$

Written Copy. Write each sum.

	a	*b*	*c*	*d*
1.	$8\frac{4}{9}$ $+12\frac{4}{9}$	$4\frac{2}{5}$ $+6\frac{2}{5}$	$8\frac{2}{7}$ $+4\frac{4}{7}$	$2\frac{2}{5}$ $+3\frac{1}{5}$
2.	$15\frac{3}{7}$ $+3\frac{1}{7}$	$6\frac{1}{5}$ $+9\frac{1}{5}$	$4\frac{1}{9}$ $+10\frac{4}{9}$	$11\frac{3}{5}$ $+7\frac{1}{5}$
3.	$4\frac{1}{8}$ $+11\frac{5}{8}$	$9\frac{1}{6}$ $+5\frac{1}{6}$	$19\frac{5}{9}$ $+10\frac{1}{9}$	$13\frac{1}{10}$ $+2\frac{7}{10}$
4.	$8\frac{11}{15}$ $+7\frac{4}{15}$	$8\frac{1}{4}$ $+9\frac{3}{4}$	$10\frac{2}{5}$ $+4\frac{3}{5}$	$5\frac{5}{7}$ $+9\frac{2}{7}$
5.	$2\frac{7}{12}$ $+9\frac{5}{12}$	$4\frac{3}{10}$ $+8\frac{7}{10}$	$12\frac{3}{8}$ $+14\frac{5}{8}$	$5\frac{1}{3}$ $+10\frac{2}{3}$
6.	$13\frac{5}{7}$ $+10\frac{5}{7}$	$5\frac{7}{9}$ $+4\frac{7}{9}$	$12\frac{3}{7}$ $+2\frac{6}{7}$	$8\frac{4}{9}$ $+11\frac{7}{9}$
7.	$15\frac{2}{9}$ $3\frac{4}{9}$ $+6\frac{7}{9}$	$2\frac{4}{7}$ $1\frac{2}{7}$ $+7\frac{1}{7}$	$21\frac{1}{9}$ $3\frac{4}{9}$ $+4\frac{4}{9}$	$3\frac{1}{15}$ $5\frac{7}{15}$ $+5\frac{2}{15}$

Copy and solve each equation below. Write the sum in lowest terms.

	a	*b*
8.	$5\frac{11}{12}+8\frac{7}{12}=n$	$14\frac{5}{8}+3\frac{5}{8}=n$
9.	$16\frac{3}{4}+9\frac{3}{4}=n$	$3\frac{3}{8}+4\frac{7}{8}=n$
10.	$1\frac{3}{4}+4\frac{3}{4}=n$	$2\frac{9}{10}+10\frac{3}{10}=n$
11.	$10\frac{8}{9}+3\frac{7}{9}=n$	$4\frac{7}{10}+6\frac{7}{10}=n$
12.	$4\frac{7}{10}+8\frac{1}{10}+\frac{7}{10}=n$	$6\frac{7}{15}+7\frac{4}{15}+8\frac{9}{15}=n$
13.	$5\frac{3}{10}+7\frac{9}{10}+\frac{1}{10}=n$	$2\frac{7}{8}+1\frac{3}{8}+6\frac{5}{8}=n$
14.	$15\frac{2}{9}+3\frac{4}{9}+6\frac{7}{9}=n$	$2\frac{4}{7}+1\frac{2}{7}+7\frac{1}{7}=n$
15.	$2\frac{4}{5}+1\frac{2}{5}+7\frac{1}{5}=n$	$21\frac{1}{9}+3\frac{4}{9}+4\frac{4}{9}=n$

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Using Fractions in Solving Problems

In some of the problems on this page you are to supply information. For example, you cannot find how many ounces are equal in value to $\frac{1}{4}$ of a 2-pound box of candy unless you know how many ounces are in a 1-pound box.

Read each problem carefully. Decide whether or not information must be supplied. If so, supply it before you try to solve each problem. Then write the equation for each problem. Solve the equation for n. Write each answer.

1. The Joneses buy 2 gallons of milk every day. If they use $\frac{1}{4}$ of it at breakfast, how many quarts of milk is that?

2. Robert had a board 8 feet long. He needed $\frac{3}{4}$ of it for a shelf. How long was the shelf to be?

3. Mary Ellen bought $1\frac{1}{2}$ yards of yellow cloth. How many inches of cloth is that?

4. Mary Ellen used $\frac{1}{2}$ of the cloth to make an apron. How many inches of cloth did she use?

5. George's mother baked 36 cookies. George and his friends ate $\frac{1}{4}$ of them. How many cookies did they eat?

6. Carol used $\frac{1}{3}$ of a 45-inch ribbon to trim a doll dress. How many inches of ribbon did she use?

7. Joe's mother bought a dozen bananas. The family ate $\frac{1}{3}$ of them at lunch. How many bananas were eaten?

8. Kathy used $\frac{1}{3}$ of a 3-pound box of candy for the party she gave. How many ounces of candy did she use?

9. Brian had 168 stamps in his album. He sold $\frac{1}{8}$ of them to Bob. How many stamps did he sell?

10. Nancy bought $\frac{3}{4}$ of a pound of lunch meat and $2\frac{1}{4}$ pounds of hamburger. How many pounds of meat did she buy?

11. A triangle had these dimensions: $3\frac{1}{4}$ inches, $3\frac{1}{4}$ inches, and $4\frac{3}{4}$ inches. What was the perimeter of the triangle?

12. Jack wanted to frame a picture that was $5\frac{1}{2}$ inches wide and $7\frac{1}{2}$ inches long. How many inches of frame would he need?

Something to do Write story problems of your own which can be changed to equations containing a fraction. Write the equation for each problem. Solve the equation. Write the answer to each problem.

Practice in Solving Problems

Read each problem carefully. Decide upon an equation to use in solving each problem. You will either add or multiply if you are to think of sets as being joined. You will either subtract or divide if you are to think of sets as being taken apart or compared.

1. Lucy made 36 cookies for a party. There were 9 girls at the party. How many cookies could she serve to each girl?

2. The population of Central City was 7095 in 1950. By 1960 the population had increased to 7612. What was the increase?

3. The 266 children in one school planned a picnic. There are 7 buses. How many children should ride in each bus?

4. Jack bought candy as follows: peanut brittle, $\frac{1}{4}$ lb.; peppermint, $\frac{1}{4}$ lb.; orange slices, $\frac{1}{4}$ lb. What fraction of a pound of candy did he buy? How many ounces did he have?

5. One afternoon Jack walked 1 mile, $\frac{2}{3}$ of a mile, and $\frac{2}{3}$ of a mile. How many miles did he walk in all?

6. Jane used $2\frac{3}{4}$ yd. of blue material and $\frac{1}{4}$ yd. of red to make aprons. How many yards of material did she use in all?

7. Mr. Daniels had 250 chickens. He sold 26 chickens. Then he divided the rest of them equally among 4 pens. How many chickens did he have in each pen?

8. Mr. Doyle bought 15 gallons of gasoline at $.31 a gallon. How much change should he receive from $5.00?

9. Tom worked $3\frac{1}{4}$ hours in the morning and $\frac{1}{4}$ of an hour in the afternoon. How many hours did he work in all?

10. George watched television $\frac{1}{4}$ hour on Friday, $1\frac{1}{4}$ hours on Saturday, and $\frac{3}{4}$ hour on Sunday. How many hours did he spend watching television during these three days?

Review and Practice

Part 1 Copy. Find each sum. Change to lowest terms. Change improper fractions to mixed fractions.

	a	*b*	*c*	*d*
1.	$\frac{4}{5}$ $\frac{2}{5}$ $+\frac{2}{5}$	$\frac{5}{17}$ $\frac{1}{17}$ $+\frac{8}{17}$	$\frac{3}{9}$ $\frac{2}{9}$ $+\frac{1}{9}$	$\frac{1}{35}$ $\frac{10}{35}$ $+\frac{2}{35}$
2.	$\frac{5}{6}$ $\frac{1}{6}$ $+\frac{1}{6}$	$\frac{1}{13}$ $\frac{5}{13}$ $+\frac{7}{13}$	$11\frac{1}{9}$ $5\frac{2}{9}$ $+25\frac{7}{9}$	$15\frac{1}{12}$ $30\frac{10}{12}$ $+29\frac{3}{12}$

Part 2 Copy and solve each equation below. Change to lowest terms.

	a	*b*
1.	$\frac{3}{10}+\frac{7}{10}+\frac{4}{10}=n$	$\frac{1}{4}+3\frac{3}{4}+18\frac{3}{4}=n$
2.	$\frac{10}{25}+\frac{3}{25}+\frac{16}{25}=n$	$29\frac{3}{8}+17\frac{5}{8}+\frac{4}{8}=n$

Part 3 Copy. Find each sum and difference. Check.

	a	*b*	*c*
1.	2178 +1280	9430 +3409	1650 +5617
2.	9121 6307 4581 +4754	2582 3692 4706 +5827	8285 2963 4703 +6039
3.	7632 −2706	8521 −3456	9410 −6849
4.	9877 −6150	7606 −2079	5432 −3548

Part 4 Copy. Find each product. Check.

	a	*b*	*c*
1.	2851 ×9	8076 ×6	3962 ×8
2.	988 ×42	700 ×25	635 ×17
3.	652 ×94	734 ×39	967 ×26
4.	598 ×180	608 ×404	973 ×313
5.	876 ×391	327 ×522	610 ×373

Part 5 Copy. Find each quotient. Express any non-zero remainders in fractional form. Check.

	a	*b*	*c*
1.	$3\overline{)906}$	$4\overline{)248}$	$7\overline{)560}$
2.	$8\overline{)638}$	$2\overline{)128}$	$6\overline{)594}$
3.	$5\overline{)680}$	$3\overline{)742}$	$6\overline{)983}$
4.	$8\overline{)925}$	$7\overline{)587}$	$4\overline{)565}$
5.	$6\overline{)704}$	$9\overline{)535}$	$4\overline{)781}$
6.	$9\overline{)8076}$	$6\overline{)3003}$	$8\overline{)9109}$

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. To add fractional numbers, add the numbers named by the numerators and write the sum over the common denominator. (265)

2. A fraction is in lowest terms when the numerator and the denominator are divisible only by 1. (267)

3. To reduce a fraction to lowest terms, divide the numerator and denominator by the same number. (267)

Words to Know

1. Numerator, denominator, fractions with common denominator (264)

2. Lowest terms (267)

3. Simplest form (276)

Questions to Discuss

1. How can you use a number line to show the addition of $\frac{3}{5}$ to $\frac{1}{5}$? (263)

2. What steps do you take in changing $\frac{6}{10}$ to lowest terms? (267)

3. Which of these fractions, $\frac{4}{5}$, $\frac{6}{6}$, $\frac{7}{7}$, and $\frac{3}{4}$, have a value of 1? How do you know? (269)

4. What steps do you take in adding $2\frac{7}{8}$ to $2\frac{5}{8}$? (277)

Written Practice

Copy. Solve each equation for n.

	a	*b*	
1.	$\frac{1}{5}+\frac{3}{5}=n$	$n+\frac{1}{3}=\frac{2}{3}$	(265)
2.	$\frac{1}{5}+\frac{2}{5}+\frac{1}{5}=n$	$\frac{2}{7}+n=\frac{6}{7}$	(266)
3.	$\frac{1}{8}+\frac{3}{8}=n$	$\frac{5}{12}+\frac{3}{12}=n$	(268)
4.	$\frac{1}{2}+\frac{1}{2}=n$	$\frac{5}{16}+n=1$	(269)
5.	$\frac{4}{5}+\frac{4}{5}=n$	$n+\frac{2}{3}=1\frac{1}{3}$	(271)
6.	$\frac{5}{6}+\frac{5}{6}=n$	$\frac{5}{12}+\frac{9}{12}=n$	(272)
7.	$3\frac{1}{2}+\frac{1}{2}=n$	$\frac{3}{5}+1\frac{1}{5}=n$	(275)
8.	$1\frac{3}{4}+1\frac{3}{4}=n$	$4\frac{3}{10}+5\frac{9}{10}=n$	(277)

Solve these problems.

9. Ray spent $\frac{2}{7}$ of his weekly allowance on Monday, $\frac{1}{7}$ of it on Tuesday, and $\frac{3}{7}$ of it on Wednesday. What fraction of his weekly allowance had he spent on those 3 days? (266)

10. Ruth bought $\frac{1}{2}$ lb. of mints, $\frac{1}{2}$ lb. of jelly beans, and $\frac{1}{2}$ lb. of caramels. How many ounces of candy did she buy? (271)

11. Mr. Walters bought $1\frac{1}{2}$ T. of bran, 300 lbs. of ground oats, and $\frac{1}{2}$ T. of ground corn. How many pounds of feed did he buy? (275)

Self-Evaluation

Part 1 Follow these directions.

1. Write the letter printed above each pair of fractions with common denominators.

a	*b*	*c*
$\frac{3}{5}, \frac{1}{5}$	$\frac{1}{4}, \frac{3}{8}$	$\frac{5}{16}, \frac{9}{16}$

2. Write the numerator of $\frac{3}{5}$.

3. Write the denominator of $\frac{9}{10}$.

4. Write the letter printed above each fraction that is in lowest terms.

a	*b*	*c*	*d*
$\frac{1}{3}$	$\frac{4}{6}$	$\frac{7}{5}$	$\frac{3}{8}$

5. Write the letter printed above each improper fraction.

a	*b*	*c*	*d*
$1\frac{1}{2}$	$\frac{6}{5}$	$\frac{3}{4}$	$\frac{8}{7}$

Part 2 Copy. Solve each equation. Write each sum in lowest terms.

	a	*b*
1.	$\frac{1}{6}+\frac{1}{6}=n$	$\frac{1}{8}+\frac{3}{8}=n$
2.	$\frac{2}{3}+\frac{1}{3}=n$	$\frac{3}{5}+n=1$
3.	$\frac{2}{3}+\frac{2}{3}=n$	$\frac{4}{7}+\frac{4}{7}=n$
4.	$\frac{4}{5}+n=\frac{7}{5}$	$n+\frac{4}{5}=\frac{9}{5}$
5.	$\frac{3}{4}+\frac{3}{4}=n$	$\frac{5}{6}+\frac{5}{6}=n$
6.	$\frac{11}{12}+\frac{7}{12}=n$	$\frac{3}{10}+n=\frac{12}{10}$

Part 3 Copy. Write each sum. Check by adding in another order.

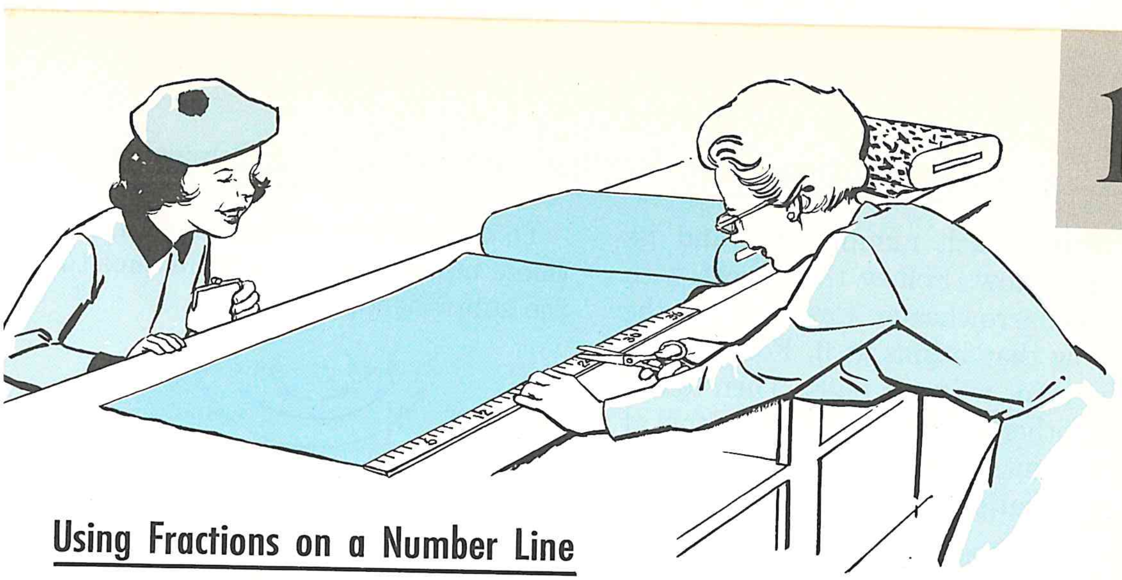
	a	*b*	*c*
1.	$7\frac{1}{9}$ $+8\frac{7}{9}$	$4\frac{1}{5}$ $+8\frac{1}{5}$	$\frac{2}{5}$ $+6\frac{2}{5}$
2.	$1\frac{3}{10}$ $+4\frac{1}{10}$	$3\frac{1}{6}$ $+8\frac{1}{6}$	$7\frac{3}{8}$ $+9\frac{3}{8}$
3.	$4\frac{1}{3}$ $+6\frac{2}{3}$	$8\frac{7}{12}$ $+4\frac{5}{12}$	$9\frac{7}{10}$ $+3\frac{3}{10}$
4.	$2\frac{1}{5}$ $4\frac{3}{5}$ $+7\frac{4}{5}$	$5\frac{3}{5}$ $3\frac{4}{5}$ $+2\frac{2}{5}$	$8\frac{1}{3}$ $1\frac{2}{3}$ $+6\frac{2}{3}$
5.	$3\frac{3}{10}$ $1\frac{9}{10}$ $+2\frac{3}{10}$	$4\frac{5}{6}$ $6\frac{5}{6}$ $+9\frac{5}{6}$	$5\frac{9}{10}$ $2\frac{7}{10}$ $+5\frac{9}{10}$

Part 4 Solve these problems.

1. $\frac{9}{10}$ of an inch of rain fell on Saturday and $\frac{2}{10}$ of an inch of rain fell on Sunday. How much rain fell altogether on the two days?

2. Barbara bought $2\frac{1}{3}$ yards of curtain material. Ann bought $4\frac{2}{3}$ yards of material. How many yards of material did the two girls buy?

3. In a class of 32 pupils, $\frac{3}{4}$ of the pupils belonged to the school chorus. How many of the pupils belonged to the chorus?



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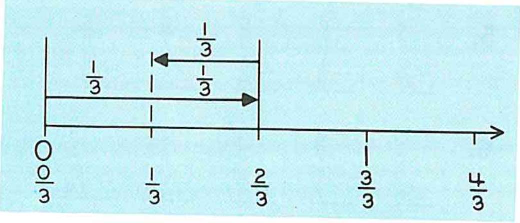
Using Fractions on a Number Line

Joan bought $\frac{2}{3}$ of a yard of material. She used $\frac{1}{3}$ of a yard. How much material did she have left?

To find the part that is left, you are to think of a length as separated into parts. So you subtract the numbers. The equation is $\frac{2}{3}-\frac{1}{3}=n$.

The diagram below will help you see what happens when you add $\frac{1}{3}$ to $\frac{1}{3}$, and when you subtract $\frac{1}{3}$ from $\frac{2}{3}$.

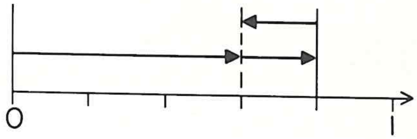


One arrow with a closed arrowhead begins at 0. Where does it end? It shows the addition of $\frac{1}{3}$ and $\frac{1}{3}$. The other arrow with a closed arrowhead begins at $\frac{2}{3}$. It points in the direction opposite to that of the first one. It shows subtraction.

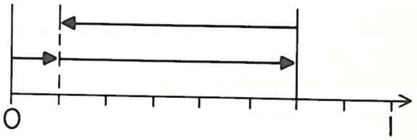
Look at the arrow that begins at $\frac{2}{3}$. Its head points to $\frac{1}{3}$. It shows that $\frac{2}{3}-\frac{1}{3}=\frac{1}{3}$. Joan had $\frac{1}{3}$ of a yard left.

Oral Tell which fractions belong on the scale of the diagrams below.

1.



2.



Answer these questions.

3. What addition is shown in diagram 1 above? In diagram 2?

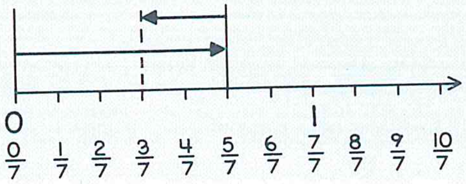
4. What subtraction is shown in diagram 1? In 2?

5. Does $\frac{4}{5}-\frac{1}{5}=\frac{4-1}{5}=\frac{3}{5}$?

6. Does $\frac{6}{8}-\frac{5}{8}=\frac{6-5}{8}=\frac{1}{8}$?

Subtraction: Using Fractions with a Common Denominator

Study each number line and its scale below. Follow the arrows with closed arrowheads. First look at the arrow that begins at 0. Follow it to the point where it ends. Then follow the other arrow to the left. Stop at the point where it ends. Finally read the equations below the diagram.



0
1
$\frac{0}{7}$ $\frac{1}{7}$ $\frac{2}{7}$ $\frac{3}{7}$ $\frac{4}{7}$ $\frac{5}{7}$ $\frac{6}{7}$ $\frac{7}{7}$ $\frac{8}{7}$ $\frac{9}{7}$ $\frac{10}{7}$

$$\frac{3}{7}+\frac{2}{7}=\frac{3+2}{7}=\frac{5}{7} \qquad \frac{5}{7}-\frac{2}{7}=\frac{5-2}{7}=\frac{3}{7}$$

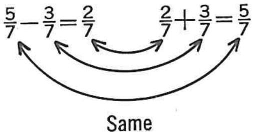
When adding numbers named by fractions having a common denominator, you write the sum of the numerators over the denominator.

When subtracting numbers named by fractions having a common denominator, write the difference of the numerators over the denominator.

Notice below how subtraction of fractional numbers is similar to subtraction of whole numbers.

$$\begin{array}{rr} 5 \text{ ones} & 5 \\ -3 \text{ ones} & -3 \\ \hline 2 \text{ ones} & 2 \end{array} \qquad \begin{array}{rr} 5 \text{ sevenths} & \frac{5}{7} \\ -3 \text{ sevenths} & -\frac{3}{7} \\ \hline 2 \text{ sevenths} & \frac{2}{7} \end{array}$$

To check the subtraction of fractional numbers, add the difference to the subtrahend, thus:



$$\frac{5}{7}-\frac{3}{7}=\frac{2}{7} \qquad \frac{2}{7}+\frac{3}{7}=\frac{5}{7}$$

Oral Read. Replace each n with a fraction.

	a	*b*
1.	$\frac{1}{5}+\frac{1}{5}=n$	$\frac{2}{5}-\frac{1}{5}=n$
2.	$\frac{1}{7}+\frac{4}{7}=n$	$\frac{5}{7}-\frac{4}{7}=n$
3.	$\frac{3}{7}+\frac{2}{7}=n$	$\frac{5}{7}-\frac{2}{7}=n$
4.	$\frac{4}{5}-n=\frac{3}{5}$	$n-\frac{3}{5}=\frac{1}{5}$

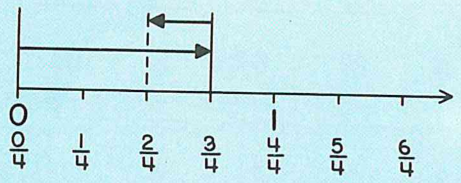
Read. Tell the steps taken in doing each subtraction below.

	a	*b*	*c*	*d*	*e*
5.	$\begin{array}{r}\frac{4}{7}\\-\frac{2}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{2}{9}\\-\frac{1}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{9}\\-\frac{4}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{6}{7}\\-\frac{3}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{8}\\-\frac{4}{8}\\\hline\end{array}$
6.	$\begin{array}{r}\frac{3}{5}\\-\frac{2}{5}\\\hline\end{array}$	$\begin{array}{r}\frac{4}{7}\\-\frac{1}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{9}\\-\frac{2}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{13}{16}\\-\frac{9}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{11}{19}\\-\frac{8}{19}\\\hline\end{array}$
7.	$\begin{array}{r}\frac{17}{25}\\-\frac{11}{25}\\\hline\end{array}$	$\begin{array}{r}\frac{21}{27}\\-\frac{19}{27}\\\hline\end{array}$	$\begin{array}{r}\frac{10}{11}\\-\frac{8}{11}\\\hline\end{array}$	$\begin{array}{r}\frac{12}{13}\\-\frac{9}{13}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{9}\\-\frac{7}{9}\\\hline\end{array}$

Written Copy each equation and subtraction in column form in rows 1 through 7 above. Solve each equation for n. Write each difference.

Practice in Subtraction Using a Common Denominator

The subtraction of $\frac{1}{4}$ from $\frac{3}{4}$ is shown on the number line below.



$$\frac{3}{4} - \frac{1}{4} = \frac{3-1}{4} = \frac{2}{4}$$

The difference, $\frac{2}{4}$, is not in lowest terms and should be reduced to $\frac{1}{2}$. In column form, the subtraction may be done as at the right.

$$\begin{array}{r} \frac{3}{4} \\ -\frac{1}{4} \\ \hline \frac{2}{4} = \frac{1}{2} \end{array}$$

What steps do you take in changing $\frac{4}{6}$ to lowest terms? In changing $\frac{6}{9}$?

Oral Read. Complete each statement below. Give each difference in reduced form.

	a	*b*
1.	$\frac{7}{8}-\frac{3}{8}=$___	$\frac{5}{6}-\frac{1}{6}=$___
2.	$\frac{7}{9}-\frac{1}{9}=$___	$\frac{7}{8}-\frac{1}{8}=$___
3.	$\frac{5}{8}-\frac{1}{8}=$___	$\frac{7}{10}-\frac{3}{10}=$___
4.	$\frac{9}{10}-\frac{1}{10}=$___	$\frac{7}{16}-\frac{1}{16}=$___
5.	$\frac{3}{4}-\frac{1}{4}=$___	$\frac{11}{12}-\frac{5}{12}=$___
6.	$\frac{9}{16}-\frac{1}{16}=$___	$\frac{8}{9}-\frac{5}{9}=$___

Written Copy. Write each difference. Reduce to lowest terms.

	a	*b*	*c*	*d*	*e*
1.	$\begin{array}{r}\frac{4}{15}\\-\frac{1}{15}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{16}\\-\frac{1}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{8}\\-\frac{3}{8}\\\hline\end{array}$	$\begin{array}{r}\frac{13}{16}\\-\frac{3}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{13}{14}\\-\frac{9}{14}\\\hline\end{array}$
2.	$\begin{array}{r}\frac{11}{16}\\-\frac{3}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{10}\\-\frac{3}{10}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{10}\\-\frac{1}{10}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{12}\\-\frac{5}{12}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{15}\\-\frac{2}{15}\\\hline\end{array}$
3.	$\begin{array}{r}\frac{7}{15}\\-\frac{1}{15}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{10}\\-\frac{1}{10}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{16}\\-\frac{1}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{16}\\-\frac{7}{16}\\\hline\end{array}$	$\begin{array}{r}\frac{11}{16}\\-\frac{7}{16}\\\hline\end{array}$
4.	$\begin{array}{r}\frac{9}{10}\\-\frac{7}{10}\\\hline\end{array}$	$\begin{array}{r}\frac{11}{15}\\-\frac{2}{15}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{9}\\-\frac{4}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{11}{12}\\-\frac{7}{12}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{16}\\-\frac{1}{16}\\\hline\end{array}$

Copy. Solve each equation. Write each difference in reduced form.

	a	*b*
5.	$\frac{15}{16}-\frac{7}{16}=n$	$\frac{13}{15}-\frac{8}{15}=n$
6.	$\frac{8}{9}-\frac{5}{9}=n$	$\frac{8}{15}-\frac{2}{15}=n$
7.	$\frac{7}{12}-\frac{1}{12}=n$	$\frac{7}{16}-\frac{5}{16}=n$

Solve these problems:

8. Ralph has one piece of plywood $\frac{7}{8}$ of an inch thick and another piece $\frac{5}{8}$ of an inch thick. What fraction of an inch is the difference in thickness between the two pieces?

9. Ralph has a board $\frac{13}{16}$ of an inch thick. When he has planed $\frac{1}{16}$ of an inch from it, what fraction of an inch thick will it be?

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Mixed Fractions in Subtraction

Mary had a strip of cardboard that was $5\frac{7}{8}$ inches wide. From it she cut a strip of cardboard $1\frac{1}{8}$ inches wide. What was the width of the strip of cardboard that was left?

The equation is $5\frac{7}{8}-1\frac{1}{8}=n$. Why? It can be solved in column form as shown.

Think: $\frac{7}{8}-\frac{1}{8}=\frac{6}{8}$. Write $\frac{6}{8}$. $5-1=4$. Write 4. The difference between $1\frac{1}{8}$ and $5\frac{7}{8}$ is $4\frac{6}{8}$, or $4\frac{3}{4}$.

$$\begin{array}{r} 5\frac{7}{8} \\ -1\frac{1}{8} \\ \hline 4\frac{6}{8}=4\frac{3}{4} \end{array}$$

The strip of cardboard that was left was $4\frac{3}{4}$ inches wide.

Oral Tell the steps taken in each subtraction below.

	a	*b*	*c*
1.	$\begin{array}{r} 4\frac{2}{3} \\ -\frac{1}{3} \\ \hline 4\frac{1}{3} \end{array}$	$\begin{array}{r} 4\frac{1}{2} \\ -4 \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} 13\frac{5}{8} \\ -10\frac{5}{8} \\ \hline 3 \end{array}$
2.	$\begin{array}{r} 3\frac{5}{8} \\ -1\frac{1}{8} \\ \hline 2\frac{4}{8}=2\frac{1}{2} \end{array}$	$\begin{array}{r} 9\frac{7}{10} \\ -9\frac{1}{10} \\ \hline \frac{6}{10}=\frac{3}{5} \end{array}$	$\begin{array}{r} 6\frac{11}{16} \\ -3\frac{3}{16} \\ \hline 3\frac{8}{16}=3\frac{1}{2} \end{array}$

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Written Copy. Write each difference. Check by using addition.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 7\frac{7}{9} \\ -\frac{2}{9} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{3}{5} \\ -\frac{1}{5} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{3}{7} \\ -\frac{2}{7} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{4}{5} \\ -\frac{2}{5} \\ \hline \end{array}$
2.	$\begin{array}{r} 6\frac{5}{7} \\ -\frac{3}{7} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{2}{3} \\ -\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{5}{6} \\ -\frac{5}{6} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{1}{10} \\ -\frac{1}{10} \\ \hline \end{array}$
3.	$\begin{array}{r} 8\frac{3}{8} \\ -\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{9}{14} \\ -\frac{9}{14} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{6}{7} \\ -\frac{6}{7} \\ \hline \end{array}$	$\begin{array}{r} 10\frac{5}{9} \\ -\frac{5}{9} \\ \hline \end{array}$
4.	$\begin{array}{r} 14\frac{7}{16} \\ -\frac{7}{16} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ -\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{1}{2} \\ -4 \\ \hline \end{array}$	$\begin{array}{r} 2\frac{3}{4} \\ -2 \\ \hline \end{array}$
5.	$\begin{array}{r} 9\frac{7}{15} \\ -4 \\ \hline \end{array}$	$\begin{array}{r} 9\frac{5}{9} \\ -9 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{7}{8} \\ -6 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{3}{5} \\ -7 \\ \hline \end{array}$

Copy. Solve each equation. Write each difference in reduced form.

	a	*b*
6.	$4\frac{7}{9}-1=n$	$5\frac{3}{4}-2=n$
7.	$4\frac{7}{8}-\frac{3}{8}=n$	$6\frac{2}{3}-3=n$
8.	$8\frac{9}{16}-\frac{5}{16}=n$	$7\frac{5}{12}-\frac{1}{12}=n$
9.	$13\frac{7}{16}-\frac{3}{16}=n$	$24\frac{7}{8}-\frac{1}{8}=n$

Solve these problems:

10. Ann's mother bought $3\frac{2}{3}$ yards of cloth for a dress. When she finished the dress, she had $\frac{1}{3}$ of a yard of cloth left. How many yards of cloth had she used?

11. John's garden has a perimeter of $17\frac{5}{8}$ feet. John has $11\frac{3}{8}$ feet of wire fence. How much more wire fence does he need to put a fence around his garden?

Solving Problems

Read each problem carefully. Decide upon the equation to use in solving each one. If you are to join groups, or sets, that are unequal in size, add the numbers. If you are to separate a set into parts, or if you are to find by how many the number of one set is greater than another, subtract the numbers. Write your equation for each problem.

1. Bob's father glued a $1\frac{3}{8}$-inch strip of board to the edge of a $4\frac{5}{8}$-inch board. How wide was the board after the pieces were glued together?

2. John had a board $9\frac{3}{4}$ inches long. He cut $1\frac{1}{4}$ inches off one end of it. How much of the board was left?

3. Roger had one board that was $7\frac{13}{16}$ inches wide and another board $4\frac{12}{16}$ inches wide. What was the difference in the widths of the two boards?

4. Dick cut a $4\frac{7}{8}$-inch piece of board from a longer board. Then the length of the longer board was $7\frac{1}{8}$ inches. How long was the board before Dick cut it?

5. How much longer is a fish that is $15\frac{1}{2}$ inches long than a fish that is 9 inches long?

6. Jane walked $\frac{7}{10}$ of a mile. She said, "I must walk another $\frac{7}{10}$ of a mile before I get home." How far was Jane from her home before she began walking?

7. Mrs. Anderson used $2\frac{1}{4}$ pounds of butter in the first week of May, $1\frac{3}{4}$ pounds in the second week, and 2 pounds in the third week. How many pounds of butter did she use in the 3 weeks?

8. Al is supposed to practice his piano lesson for at least $3\frac{1}{2}$ hours each week. On Monday he practiced $\frac{1}{2}$ hour and on Tuesday he practiced 1 hour. How many more hours of practice did he need for the rest of the week?

9. After $1\frac{1}{2}$ pounds of apples were taken out, a bag of apples weighed $3\frac{1}{2}$ pounds. What was the weight of the bag of apples before the $1\frac{1}{2}$ pounds were taken out?

10. Jane needs $2\frac{1}{8}$ yards of material. She has a piece of material that is $3\frac{5}{8}$ yards long. If she cuts off the piece that she needs, how much material will be left?

Oral Tell the class the equation you decided to use in solving each of the above problems.

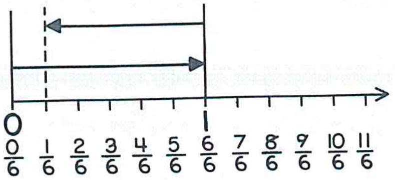
Written Solve each problem above. Write each answer in reduced form.

Subtracting a Fractional Number from 1

Mary had 1 yard of ribbon. She cut off a piece that was $\frac{5}{6}$ of a yard long. What fraction of a yard of ribbon was left?

You are to separate a length into smaller lengths that are unequal in size; so you subtract the numbers. The equation is $1-\frac{5}{6}=n$.

The numeral 1 names a whole number. Another name for 1 is $\frac{6}{6}$, as shown below.



You can see that $\frac{6}{6}-\frac{5}{6}=\frac{6-5}{6}=\frac{1}{6}$. Does $1-\frac{5}{6}=\frac{1}{6}$?

In column form, the subtraction of $\frac{5}{6}$ from 1 may be done as shown.

$$\begin{array}{rl} 1 & =\frac{6}{6} \\ -\ \frac{5}{6} & =\frac{5}{6} \\ \hline & \ \ \frac{1}{6} \end{array}$$

Oral Read. Complete each statement below.

1. ___ halves is another name for 1.
2. ___ thirds is another name for 1.
3. ___ fourths is another name for 1.
4. ___ fifths is another name for 1.

Read. Supply the missing number word.

	a	*b*
5.	$1-\frac{1}{2}=n$	$1-\frac{2}{3}=n$
6.	$1-\frac{1}{4}=n$	$1-\frac{3}{4}=n$

Written Copy. Write each difference. Check.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}1\\-\frac{3}{4}\\\hline\end{array}$	$\begin{array}{r}1\\-\frac{1}{6}\\\hline\end{array}$	$\begin{array}{r}1\\-\frac{5}{6}\\\hline\end{array}$	$\begin{array}{r}1\\-\frac{7}{12}\\\hline\end{array}$
2.	$\begin{array}{r}1\\-\frac{3}{10}\\\hline\end{array}$	$\begin{array}{r}1\\-\frac{5}{8}\\\hline\end{array}$	$\begin{array}{r}1\\-\frac{4}{7}\\\hline\end{array}$	$\begin{array}{r}1\\-\frac{3}{5}\\\hline\end{array}$

A quick review

	a	*b*	*c*	*d*
1.	$\begin{array}{r}3\frac{7}{8}\\-1\frac{1}{8}\\\hline\end{array}$	$\begin{array}{r}8\frac{7}{10}\\-1\frac{1}{10}\\\hline\end{array}$	$\begin{array}{r}4\frac{5}{8}\\-2\frac{1}{8}\\\hline\end{array}$	$\begin{array}{r}3\frac{2}{3}\\-\frac{1}{3}\\\hline\end{array}$
2.	$\begin{array}{r}8\frac{9}{10}\\-1\frac{7}{10}\\\hline\end{array}$	$\begin{array}{r}9\frac{4}{5}\\-7\frac{2}{5}\\\hline\end{array}$	$\begin{array}{r}6\frac{5}{7}\\-3\frac{1}{7}\\\hline\end{array}$	$\begin{array}{r}5\frac{5}{9}\\-2\frac{2}{9}\\\hline\end{array}$
3.	$\begin{array}{r}8\frac{4}{5}\\-\frac{3}{5}\\\hline\end{array}$	$\begin{array}{r}7\frac{5}{12}\\-2\frac{1}{12}\\\hline\end{array}$	$\begin{array}{r}8\frac{7}{8}\\-3\\\hline\end{array}$	$\begin{array}{r}3\frac{4}{5}\\-1\frac{1}{5}\\\hline\end{array}$

Copy. Solve each equation. Write each difference in reduced form.

	a	*b*
4.	$5\frac{11}{12}-4\frac{5}{12}=n$	$14\frac{2}{5}-\frac{1}{5}=n$
5.	$2\frac{6}{7}-1\frac{5}{7}=n$	$9\frac{7}{12}-7\frac{5}{12}=n$
6.	$8\frac{5}{16}-4\frac{3}{16}=n$	$7\frac{3}{10}-2\frac{1}{10}=n$

Subtraction: Using Fractions and Mixed Fractions

Nancy needs $1\frac{1}{3}$ cups of milk to make a pudding. She has only $\frac{2}{3}$ of a cup. How much more does she need?

You are to find by how many the number of one set is greater than another; so you subtract the numbers. The equation is $1\frac{1}{3}-\frac{2}{3}=n$.

You know that another name for 1 is $\frac{3}{3}$. Then $1\frac{1}{3}$ may be written $\frac{3}{3}+\frac{1}{3}=\frac{3+1}{3}=\frac{4}{3}$. Do you know how to subtract $\frac{2}{3}$ from $\frac{4}{3}$?

Study the subtraction below.

$$\begin{array}{lr} & 1\frac{1}{3}-\frac{2}{3}=n \\ \text{Becomes} & (\frac{3}{3}+\frac{1}{3})-\frac{2}{3}=n \\ \text{Then} & \frac{4}{3}-\frac{2}{3}=n \\ \text{Then} & \frac{4-2}{3}=n \\ \text{Then} & \frac{2}{3}=n \end{array}$$

Nancy needs $\frac{2}{3}$ of a cup of milk.

Oral Explain the steps taken in solving each equation below.

	a	*b*
1.	$1\frac{1}{8}-\frac{5}{8}=n$ $(\frac{8}{8}+\frac{1}{8})-\frac{5}{8}=n$ $\frac{9}{8}-\frac{5}{8}=n$ $\frac{4}{8}=n$	$1\frac{1}{4}-\frac{3}{4}=n$ $(\frac{4}{4}+\frac{1}{4})-\frac{3}{4}=n$ $\frac{5}{4}-\frac{3}{4}=n$ $\frac{2}{4}=n$
2.	$1\frac{1}{6}-\frac{5}{6}=n$ $(\frac{6}{6}+\frac{1}{6})-\frac{5}{6}=n$ $\frac{7}{6}-\frac{5}{6}=n$ $\frac{2}{6}=n$	$1\frac{3}{5}-\frac{4}{5}=n$ $(\frac{5}{5}+\frac{3}{5})-\frac{4}{5}=n$ $\frac{8}{5}-\frac{4}{5}=n$ $\frac{4}{5}=n$

Written Copy. Solve each equation below for n.

	a	*b*
1.	$1\frac{1}{3}-\frac{2}{3}=n$	$1\frac{1}{5}-\frac{2}{5}=n$
2.	$1\frac{3}{8}-\frac{7}{8}=n$	$1\frac{1}{12}-\frac{7}{12}=n$
3.	$1\frac{5}{16}-\frac{9}{16}=n$	$1\frac{1}{8}-\frac{7}{8}=n$
4.	$1\frac{7}{12}-\frac{11}{12}=n$	$1\frac{3}{10}-\frac{7}{10}=n$
5.	$1\frac{11}{16}-\frac{13}{16}=n$	$1\frac{5}{12}-\frac{7}{12}=n$

Can you do this? Each dot in the subtractions below represents a missing whole number or fractional number. Can you find each one?

a	*b*	*c*	*d*
$\begin{array}{r} \bullet\frac{1}{7} \\ -\frac{5}{7} \\ \hline 1\frac{3}{7} \end{array}$	$\begin{array}{r} 8\bullet \\ -\bullet\frac{2}{9} \\ \hline 5 \end{array}$	$\begin{array}{r} 3\frac{5}{8} \\ -\bullet\bullet \\ \hline 1\frac{7}{8} \end{array}$	$\begin{array}{r} \bullet\bullet \\ -6\frac{1}{3} \\ \hline 3\frac{1}{3} \end{array}$

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Subtraction: Using Mixed Fractions in Column Form

To solve some problems, we need to subtract a number named by a fraction from a number named by a mixed fraction. Such a subtraction may be done in column form or in equation form.

Suppose, for example, that you are to subtract $\frac{3}{5}$ from $2\frac{1}{5}$. In column form the subtraction is written as shown. You cannot subtract $\frac{3}{5}$ from $\frac{1}{5}$, for $\frac{3}{5}$ is greater than $\frac{1}{5}$.

$$\begin{array}{r} 2\frac{1}{5} \\ \underline{-\frac{3}{5}} \end{array}$$

Begin by thinking of 2 as $1+\frac{5}{5}$. Do you see that you change the form of 1 of the ones to $\frac{5}{5}$? Then you can subtract $\frac{3}{5}$ from $2\frac{1}{5}$ by taking the following steps.

$$\begin{array}{lr} 2\frac{1}{5}=(1+\frac{5}{5})+\frac{1}{5}=1+(\frac{5}{5}+\frac{1}{5}) = & 1\frac{6}{5} \\ \underline{-\frac{3}{5}} \hspace{9em} = & \underline{-\frac{3}{5}} \\ & 1\frac{3}{5} \end{array}$$

The difference between $2\frac{1}{5}$ and $\frac{3}{5}$ is $1\frac{3}{5}$. To check the subtraction, add $\frac{3}{5}$ to $1\frac{3}{5}$. Is the sum $2\frac{1}{5}$?

Oral Tell the steps used in each of the following subtractions.

1.
$$\begin{array}{lr} 5\frac{1}{5}=(4+\frac{5}{5})+\frac{1}{5}=4+(\frac{5}{5}+\frac{1}{5}) = & 4\frac{6}{5} \\ \underline{-\frac{2}{5}} \hspace{9em} = & \underline{-\frac{2}{5}} \\ & 4\frac{4}{5} \end{array}$$

2.
$$\begin{array}{lr} 8\frac{1}{6}=(7+\frac{6}{6})+\frac{1}{6}=7+(\frac{6}{6}+\frac{1}{6}) = & 7\frac{7}{6} \\ \underline{-\frac{5}{6}} \hspace{9em} = & \underline{-\frac{5}{6}} \\ & 7\frac{2}{6}=7\frac{1}{3} \end{array}$$

3.
$$\begin{array}{lr} 7\frac{1}{3}=(6+\frac{3}{3})+\frac{1}{3}=6+(\frac{3}{3}+\frac{1}{3}) = & 6\frac{4}{3} \\ \underline{-\frac{2}{3}} \hspace{9em} = & \underline{-\frac{2}{3}} \\ & 6\frac{2}{3} \end{array}$$

Written Copy. Write each difference. Check.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 1\frac{1}{7} \\ \underline{-\frac{5}{7}} \end{array}$	$\begin{array}{r} 1\frac{2}{5} \\ \underline{-\frac{3}{5}} \end{array}$	$\begin{array}{r} 1\frac{5}{9} \\ \underline{-\frac{7}{9}} \end{array}$	$\begin{array}{r} 1\frac{2}{5} \\ \underline{-\frac{4}{5}} \end{array}$
2.	$\begin{array}{r} 3\frac{1}{9} \\ \underline{-\frac{5}{9}} \end{array}$	$\begin{array}{r} 3\frac{3}{7} \\ \underline{-\frac{5}{7}} \end{array}$	$\begin{array}{r} 2\frac{1}{5} \\ \underline{-\frac{2}{5}} \end{array}$	$\begin{array}{r} 4\frac{2}{9} \\ \underline{-\frac{7}{9}} \end{array}$
3.	$\begin{array}{r} 5\frac{5}{8} \\ \underline{-\frac{7}{8}} \end{array}$	$\begin{array}{r} 7\frac{1}{12} \\ \underline{-\frac{7}{12}} \end{array}$	$\begin{array}{r} 5\frac{1}{10} \\ \underline{-\frac{9}{10}} \end{array}$	$\begin{array}{r} 6\frac{1}{7} \\ \underline{-\frac{3}{7}} \end{array}$

Copy and solve each equation.

	a	*b*
4.	$4\frac{2}{9}-\frac{5}{9}=n$	$15\frac{1}{7}-\frac{4}{7}=n$
5.	$6\frac{1}{4}-\frac{3}{4}=n$	$7\frac{1}{6}-\frac{5}{6}=n$
6.	$10\frac{3}{5}-\frac{4}{5}=n$	$3\frac{1}{8}-\frac{7}{8}=n$

Solve these problems.

7. Sharon walked $1\frac{1}{8}$ mile to the park. Alice walked $\frac{7}{8}$ mile to get there. How much farther did Sharon have to walk than Alice?

8. Jerry brought $1\frac{1}{4}$ pound of corn to pop at the picnic. The children popped $\frac{3}{4}$ of a pound of it. How much popcorn was left? Reminder: In the answer, change a fraction to its lowest terms.

Mixed Fractions in Subtraction

Study the subtraction in A below. Why was $5\frac{1}{5}$ rewritten as $4\frac{6}{5}$ before the subtraction was possible?

A

$$\begin{array}{lr} 5\frac{1}{5}=(4+\frac{5}{5})+\frac{1}{5}=4+(\frac{5}{5}+\frac{1}{5})= & 4\frac{6}{5} \\ \underline{-2\frac{4}{5}} & \underline{-2\frac{4}{5}} \\ & 2\frac{2}{5} \end{array}$$

You may be able to do the subtraction without writing all of the steps. Now study the subtraction at the right. Which of the steps used in A were not used in B?

B

$$\begin{array}{r} 5\frac{1}{5}=4\frac{6}{5} \\ \underline{-2\frac{4}{5}=2\frac{4}{5}} \\ 2\frac{2}{5} \end{array}$$

Oral Tell the steps you would use in completing each subtraction below.

a	*b*	*c*	*d*
$\begin{array}{r}4\frac{2}{7}\\ \underline{-3\frac{3}{7}}\end{array}$	$\begin{array}{r}5\frac{1}{5}\\ \underline{-4\frac{3}{5}}\end{array}$	$\begin{array}{r}6\frac{1}{6}\\ \underline{-3\frac{5}{6}}\end{array}$	$\begin{array}{r}10\frac{3}{8}\\ \underline{-8\frac{7}{8}}\end{array}$

Written Copy. Write each difference. Be sure that your answers are in lowest terms.

	a	*b*	*c*	*d*
1.	$\begin{array}{r}9\frac{1}{5}\\ \underline{-8\frac{3}{5}}\end{array}$	$\begin{array}{r}2\frac{1}{7}\\ \underline{-1\frac{5}{7}}\end{array}$	$\begin{array}{r}8\frac{1}{9}\\ \underline{-7\frac{7}{9}}\end{array}$	$\begin{array}{r}7\frac{1}{8}\\ \underline{-3\frac{3}{8}}\end{array}$
2.	$\begin{array}{r}9\frac{5}{7}\\ \underline{-8\frac{6}{7}}\end{array}$	$\begin{array}{r}3\frac{2}{9}\\ \underline{-2\frac{7}{9}}\end{array}$	$\begin{array}{r}6\frac{1}{8}\\ \underline{-5\frac{7}{8}}\end{array}$	$\begin{array}{r}6\frac{3}{7}\\ \underline{-5\frac{4}{7}}\end{array}$

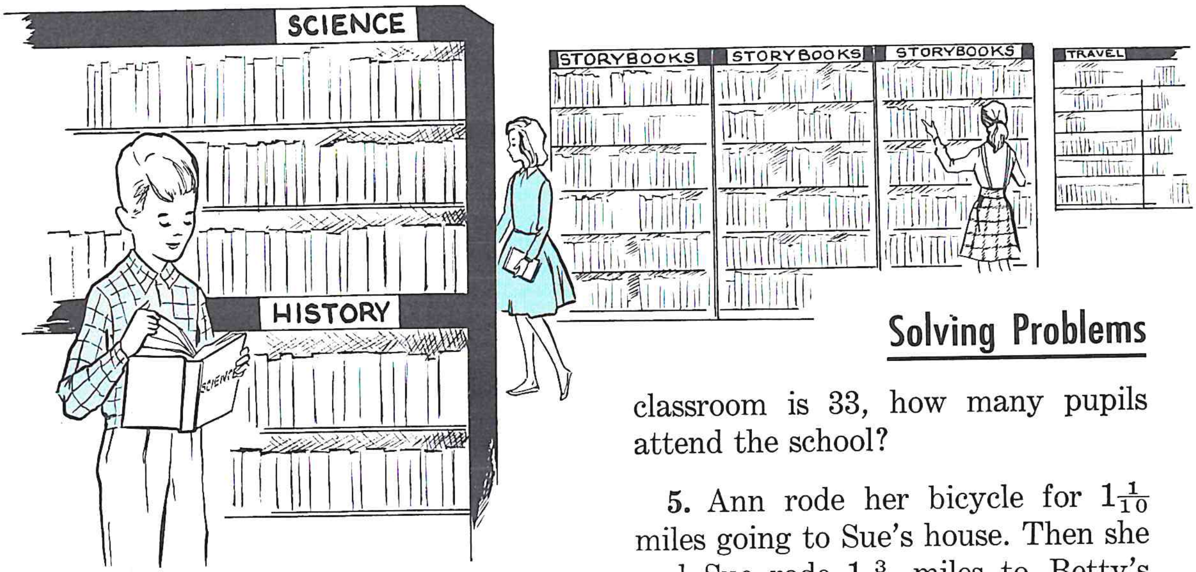
	a	*b*	*c*	*d*
3.	$\begin{array}{r}9\frac{4}{9}\\ \underline{-8\frac{7}{9}}\end{array}$	$\begin{array}{r}3\frac{3}{10}\\ \underline{-2\frac{7}{10}}\end{array}$	$\begin{array}{r}8\frac{1}{9}\\ \underline{-7\frac{4}{9}}\end{array}$	$\begin{array}{r}9\frac{3}{8}\\ \underline{-4\frac{7}{8}}\end{array}$
4.	$\begin{array}{r}6\frac{1}{8}\\ \underline{-5\frac{5}{8}}\end{array}$	$\begin{array}{r}9\frac{1}{6}\\ \underline{-8\frac{5}{6}}\end{array}$	$\begin{array}{r}6\frac{5}{8}\\ \underline{-5\frac{7}{8}}\end{array}$	$\begin{array}{r}4\frac{2}{9}\\ \underline{-3\frac{5}{9}}\end{array}$

5. Betty's mother had a recipe that called for $2\frac{1}{4}$ pounds of ground meat. She wants to use $1\frac{3}{4}$ pounds of beef and the rest pork. What fraction of a pound of pork does she need?

6. A tailor used $4\frac{1}{6}$ yards of cloth for a suit for Bill and $3\frac{5}{6}$ yards for a suit for his brother. What fraction of a yard more cloth did he use for the larger suit than for the smaller suit?

7. Susan is $54\frac{3}{8}$ inches tall and Kathy is $53\frac{7}{8}$ inches tall. What fraction of an inch shorter is Kathy than Susan?

MORE PRACTICE PAGE 320



Solving Problems

Read each problem carefully. Decide how to change it to an equation. Write the equation for each problem.

1. A school library had 1775 storybooks. It also had 255 books on science, 798 books on history, 329 books on travel, and 1119 books of other kinds. How many books were in the library?

2. Lincoln School had 2325 books in its library. Jefferson School had 1789 books in its library. How many more books were in the Lincoln School library than in the Jefferson School library?

3. Franklin School has an enrollment of 980 pupils. If the school has 8 grades, what is the average number of pupils in each grade?

4. A school has 27 classrooms. If the average number of pupils per classroom is 33, how many pupils attend the school?

5. Ann rode her bicycle for $1\frac{1}{10}$ miles going to Sue's house. Then she and Sue rode $1\frac{3}{10}$ miles to Betty's house. How far had Ann ridden?

6. A school bus had room for 48 passengers. It was carrying 29 passengers. How many more passengers could it have carried?

7. Betty Lou lives $2\frac{1}{8}$ miles from school. Sue lives $1\frac{3}{8}$ miles from the school. How much closer to the school is Sue than Betty Lou?

8. Mrs. Thompson bought $2\frac{1}{2}$ pounds of steak and a $4\frac{1}{2}$-pound roast. How many pounds of meat did she buy?

Oral Tell the equation you wrote for each problem above. Tell why you decided to use the equation you wrote.

Written Solve the equation for each problem above. Write the answer to each problem.

Practice in Addition and Subtraction

Part 1 Copy. Solve each equation. Express each sum in lowest terms.

	a	*b*
1.	$\frac{2}{5}+\frac{2}{5}=n$	$\frac{2}{7}+n=\frac{5}{7}$
2.	$\frac{5}{8}+\frac{1}{8}=n$	$\frac{7}{12}+\frac{1}{12}=n$
3.	$\frac{5}{6}+\frac{1}{6}=n$	$n+\frac{1}{3}=\frac{3}{3}$
4.	$\frac{3}{16}+\frac{3}{16}=n$	$\frac{5}{8}+n=\frac{6}{8}$
5.	$\frac{5}{12}+\frac{1}{12}=n$	$n+\frac{4}{10}=\frac{5}{10}$

Part 2 Copy. Solve each equation. Express each sum as a mixed fraction.

	a	*b*
1.	$\frac{3}{5}+\frac{4}{5}=n$	$\frac{2}{3}+n=\frac{4}{3}$
2.	$\frac{2}{5}+\frac{4}{5}=n$	$n+\frac{4}{7}=\frac{10}{7}$
3.	$\frac{3}{8}+\frac{7}{8}=n$	$\frac{7}{10}+\frac{7}{10}=n$
4.	$\frac{5}{8}+\frac{7}{8}=n$	$\frac{11}{12}+n=\frac{16}{12}$

Part 3 Copy. Write each sum. Check.

	a	*b*	*c*	*d*
1.	$9\frac{1}{5}$ $+\frac{2}{5}$	$6\frac{2}{7}$ $+\frac{3}{7}$	$3\frac{3}{5}$ $+\frac{1}{5}$	$\frac{2}{9}$ $+4\frac{5}{9}$
2.	$4\frac{1}{2}$ $+1\frac{1}{2}$	$8\frac{1}{3}$ $+1\frac{2}{3}$	$5\frac{4}{7}$ $+2\frac{5}{7}$	$9\frac{4}{5}$ $+3\frac{3}{5}$
3.	$5\frac{1}{2}$ $3\frac{1}{2}$ $+2\frac{1}{2}$	$3\frac{1}{3}$ $4\frac{1}{3}$ $+7\frac{1}{3}$	$9\frac{1}{12}$ $6\frac{5}{12}$ $+8\frac{11}{12}$	$7\frac{3}{4}$ $5\frac{3}{4}$ $+2\frac{3}{4}$

Part 4 Copy. Solve each equation. Express each sum in lowest terms.

	a	*b*
1.	$\frac{3}{5}-\frac{2}{5}=n$	$\frac{5}{7}-n=\frac{1}{7}$
2.	$\frac{7}{8}-\frac{3}{8}=n$	$\frac{7}{10}-\frac{3}{10}=n$
3.	$\frac{7}{12}-\frac{5}{12}=n$	$\frac{5}{16}-\frac{3}{16}=n$
4.	$\frac{7}{8}-\frac{5}{8}=n$	$\frac{11}{12}-\frac{7}{12}=n$
5.	$\frac{13}{16}-\frac{5}{16}=n$	$\frac{5}{6}-\frac{1}{6}=n$
6.	$1-\frac{1}{3}=n$	$2-\frac{3}{4}=n$

Part 5 Copy. Write each difference. Check by adding.

	a	*b*	*c*	*d*
1.	$4\frac{4}{5}$ $-\frac{1}{5}$	$8\frac{7}{9}$ $-\frac{5}{9}$	$5\frac{2}{3}$ $-1\frac{2}{3}$	$9\frac{5}{6}$ $-2\frac{5}{6}$
2.	$8\frac{3}{5}$ -4	$6\frac{3}{4}$ -2	$9\frac{5}{6}$ $-1\frac{1}{6}$	$8\frac{7}{10}$ $-1\frac{3}{10}$
3.	$7\frac{9}{16}$ $-2\frac{7}{16}$	$6\frac{9}{10}$ $-2\frac{3}{10}$	$8\frac{7}{8}$ $-2\frac{1}{8}$	$9\frac{15}{16}$ $-1\frac{5}{16}$
4.	$1\frac{1}{5}$ $-\frac{3}{5}$	$2\frac{1}{9}$ $-1\frac{5}{9}$	$6\frac{1}{4}$ $-2\frac{3}{4}$	$9\frac{1}{6}$ $-3\frac{5}{6}$
5.	$8\frac{5}{8}$ $-5\frac{7}{8}$	$6\frac{1}{6}$ $-3\frac{5}{6}$	$9\frac{3}{8}$ $-5\frac{7}{8}$	$4\frac{3}{10}$ $-2\frac{7}{10}$
6.	$3\frac{1}{10}$ $-1\frac{7}{10}$	$4\frac{1}{8}$ $-2\frac{3}{8}$	$8\frac{1}{10}$ $-3\frac{1}{10}$	$5\frac{3}{8}$ $-1\frac{5}{8}$

Review and Practice

Part 1 Copy. Find each sum. Check by adding another way.

	a	b	c
1.	5492 62 +4536	6073 178 +4968	$52.80 .89 +6.95
2.	4327 2156 3879 +2689	6953 3874 7509 +4028	$97.53 50.07 75.15 +26.00
3.	2867 6234 1559 +2878	6789 3952 6001 +8043	$75.00 29.46 51.95 +80.43
4.	3952 8008 7601 +4017	9100 3065 4539 +7801	$81.98 62.01 14.49 +30.10

Part 2 Copy. Find each difference. Check by using addition.

	a	b	c
1.	2431 −786	9587 −520	$98.76 −4.38
2.	6000 −5214	5341 −1456	$70.09 −16.39
3.	4321 −3869	9720 −6053	$47.47 −21.83
4.	9000 −7106	8049 −3666	$76.54 −19.98

Part 3 Copy. Find each quotient. Check by using multiplication.

	a	b	c
1.	$3\overline{)108}$	$8\overline{)840}$	$6\overline{)\$9.42}$
2.	$9\overline{)693}$	$5\overline{)655}$	$7\overline{)\$9.73}$
3.	$3\overline{)1090}$	$4\overline{)8173}$	$5\overline{)\$95.81}$
4.	$7\overline{)8311}$	$6\overline{)1204}$	$9\overline{)\$91.90}$
5.	$8\overline{)7121}$	$4\overline{)1107}$	$3\overline{)\$51.51}$
6.	$9\overline{)1738}$	$6\overline{)7101}$	$4\overline{)\$67.18}$

Part 4 Copy. Find each product. Check by changing the order of the multiplier and the multiplicand and multiplying again.

	a	b	c
1.	648 ×25	924 ×61	$8.96 ×56
2.	786 ×532	427 ×365	$6.35 ×405
3.	4951 ×276	7809 ×599	$83.05 ×269
4.	9700 ×394	5431 ×645	$60.51 ×425
5.	8035 ×412	3100 ×723	$78.00 ×444

Checkup Time

The numerals in ( ) tell the pages where you can turn for help.

Important Ideas

1. When subtracting numbers named by fractions having a common denominator, write the difference of the numerators over the denominator. (284)

2. To subtract numbers named by mixed fractions, first subtract the fractional numbers and then subtract the whole numbers. (286)

3. To subtract a fractional number from the number 1, change the form of 1 to a fraction. (288, 290)

Questions to Discuss

1. On a number line, do you move to the right or to the left to add? To subtract? (283)

2. With fractional numbers, how is addition with a common denominator similar to subtraction with a common denominator? (284)

3. In a story problem which uses fractional numbers, how can you decide whether you should add or subtract? (287)

4. How do you express 1 as halves? As thirds? As fourths? (288)

5. How do you express 2 as halves? As thirds? As fourths? (289)

6. In the equation $1\frac{1}{5}-\frac{3}{5}=n$, why must the whole number 1 be changed to fifths? (290)

Written Practice

Copy. Solve each equation for n.

	a	*b*	
1.	$\frac{5}{7}-\frac{2}{7}=n$	$\frac{9}{10}-\frac{1}{10}=n$	(284, 285)
2.	$9\frac{11}{16}-3\frac{3}{16}=n$	$5\frac{9}{10}-5\frac{1}{10}=n$	(286)
3.	$1-\frac{2}{3}=n$	$1-\frac{1}{8}=n$	(288)
4.	$2-\frac{1}{2}=n$	$3-\frac{2}{3}=n$	(289)

Copy. Write each difference. Check by using addition.

	a	*b*	*c*	
5.	$\begin{array}{r} 1\frac{1}{4} \\ -\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{3} \\ -\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 1\frac{1}{8} \\ -\frac{7}{8} \\ \hline \end{array}$	(290)
6.	$\begin{array}{r} 5\frac{1}{5} \\ -3\frac{2}{5} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ -3\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{3}{8} \\ -2\frac{7}{8} \\ \hline \end{array}$	(291)

Solve these problems.

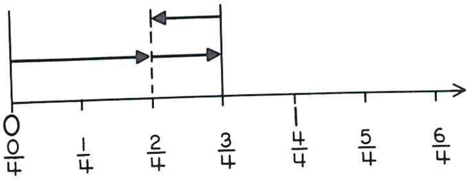
7. Mr. Cooke stopped at the filling station $1\frac{1}{4}$ miles from home. Then he drove $8\frac{3}{4}$ miles to work. How far did he drive in all? (287)

8. The Joneses bought 4 gallons of milk. They used all but $1\frac{2}{3}$ gallons. How much milk did they use? (287)

Self-Evaluation

Part 1 Write the addition equation and then the subtraction equation which can be solved by using each diagram below.

1.



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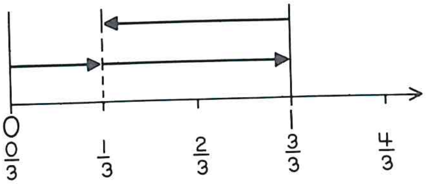

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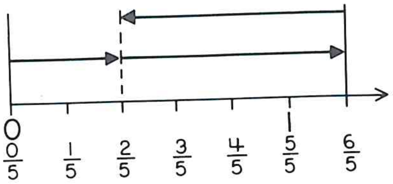


Part 2 Copy. Solve each equation for n. Check.

	a	*b*
1.	$\frac{4}{7}-\frac{1}{7}=n$	$\frac{4}{5}-\frac{3}{5}=n$
2.	$\frac{5}{9}-\frac{2}{9}=n$	$\frac{5}{12}-\frac{1}{12}=n$
3.	$5\frac{2}{3}-\frac{1}{3}=n$	$12\frac{5}{8}-\frac{5}{8}=n$
4.	$5\frac{1}{2}-5=n$	$5\frac{3}{8}-\frac{1}{8}=n$
5.	$1-\frac{1}{8}=n$	$2-\frac{1}{4}=n$

Part 3 Copy. Write each difference. Check.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 3\frac{2}{3} \\ -1\frac{1}{3} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{6}{7} \\ -2\frac{1}{7} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{8}{9} \\ -2\frac{1}{9} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{4}{5} \\ -3\frac{1}{5} \\ \hline \end{array}$
2.	$\begin{array}{r} 5\frac{7}{8} \\ -3\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{3}{16} \\ -2\frac{1}{16} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{11}{12} \\ -3\frac{5}{12} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{13}{15} \\ -4\frac{11}{15} \\ \hline \end{array}$
3.	$\begin{array}{r} 1\frac{1}{7} \\ -\frac{5}{7} \\ \hline \end{array}$	$\begin{array}{r} 1\frac{1}{5} \\ -\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{1}{8} \\ -\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{3} \\ -\frac{2}{3} \\ \hline \end{array}$
4.	$\begin{array}{r} 3\frac{1}{5} \\ -1\frac{4}{5} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{1}{5} \\ -3\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{8} \\ -2\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{2}{5} \\ -2\frac{3}{5} \\ \hline \end{array}$

Part 4 Solve each problem.

1. A salesgirl knew that there was $9\frac{2}{3}$ yards of cloth on a bolt of material. She sold $2\frac{1}{3}$ yards. How many yards of cloth were left on the bolt?

2. Bob worked for $2\frac{1}{2}$ hours one morning and for $3\frac{1}{2}$ hours in the afternoon. How many hours did he work altogether that day?

3. Jane weighed a bag of apples after taking some apples out of it. The bag of apples weighed $3\frac{1}{4}$ pounds. The label on the bag said *5 pounds.* If the label was right, how many pounds of apples had Jane used?

4. The scouts hiked $10\frac{1}{8}$ miles one day and $8\frac{5}{8}$ miles the next day. How far did they hike on both days?

18

You can review the many important ideas you have learned this year by reading the statements in tint blocks below.

You can get practice in using these ideas by completing the exercises in this chapter. The practice may be oral or written, whichever your teacher thinks will help you most. Before you do the exercises in each practice lesson, read the statement that tells you about it and study the example.

Numbers and Numerals

The value expressed by a digit is determined by its place in a numeral.

9 — 9 represents 9 ones

90 — 9 represents 9 tens

Use with page 7.

Write numerals for each number expressed below.

1. Three hundred one
2. Three thousand five hundred
3. Eight thousand twenty
4. Seven thousand thirty-five

9 is the largest number that can be shown in any place-value position.

Ten ones become 1 ten and 0 ones.

Fifteen ones become 1 ten and 5 ones.

Use with pages 8 and 9.

Write the numeral that represents each of the following.

1. Fifteen ones
2. Three tens and eleven ones
3. Eight tens and fifteen ones
4. Five tens and twenty ones
5. Nine tens and thirty ones
6. Five hundreds, ten tens, and two ones
7. Two hundreds, ten tens, and two ones

Different forms of money may be equal in value.

2 nickels are equivalent to 1 dime.

10 pennies are equivalent to 1 dime.

Use with pages 11 and 12.

Using the signs $ and ., express each of the following as a money numeral.

	a	*b*
1.	1 nickel	1 dime
2.	2 nickels	2 dimes
3.	1 quarter	3 quarters
4.	1 dollar	5 dollars

You add ones to ones, making changes in form whenever the sum of ones is more than 9.

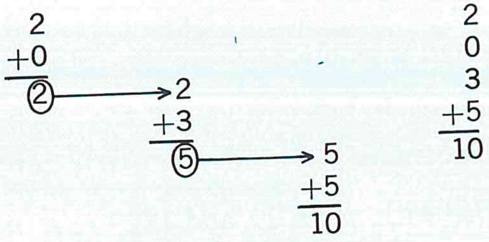
$\begin{array}{r}32\\+6\\\hline 38\end{array}$ Add the ones. Write the tens.

$\begin{array}{r}37\\+5\\\hline 42\end{array}$ Change 10 ones to 1 ten.

Use with page 20.

	a	*b*	*c*	*d*
1.	61 +5	95 +2	56 +3	1 +87
2.	25 +6	9 +46	76 +8	58 +9

No matter how many numbers you are asked to add, you can add only two numbers at a time.



Use with page 21.

	a	*b*	*c*	*d*
1.	2 4 +8	7 3 +5	3 1 +9	7 6 +6
2.	5 4 5 +4	4 7 6 +3	3 9 7 +5	8 2 9 +2

You change the form of tens to hundreds whenever the sum in tens place is more than 9.

$\begin{array}{r}97\\+6\\\hline 103\end{array}$ Change 10 ones to 1 ten. Change 10 tens to 1 hundred.

Use with page 24.

	a	*b*	*c*	*d*
1.	95 +7	98 +6	9 +93	95 +8
2.	90 3 2 +7	97 0 5 +1	8 87 6 +9	92 7 4 +1

You add tens as you add ones.

A $\begin{array}{r}25\\+23\\\hline 48\end{array}$ **B** $\begin{array}{r}94\\+41\\\hline 135\end{array}$ **C** $\begin{array}{r}97\\+28\\\hline 125\end{array}$

Use with page 25.

	a	*b*	*c*	*d*
1.	25 +23	12 +26	83 +16	47 +50
2.	94 44 +53	75 80 +82	37 91 +52	42 91 +23
3.	60 90 36 +45	72 56 27 +18	19 28 56 +29	39 15 78 +15

Hundreds are added in the same way as tens and ones.

824 Change 10 tens
+465 to 1 hundred.
1289

Use with page 27.

	a	b	c	d
1.	43 +324	567 +12	641 +87	74 +935
2.	36 927 +48	94 57 +925	78 966 +88	959 43 +87
3.	992 41 15 +54	23 532 42 +98	71 89 761 +71	89 76 99 +425

Use with page 28.

	a	b	c	d
1.	632 +178	396 +475	275 +627	569 +746
2.	261 324 +679	387 825 +789	265 657 +895	364 719 +498
3.	694 454 863 +265	827 182 497 +560	830 349 712 +539	431 923 700 +326
4.	680 760 825 +600	648 253 700 +541	392 321 219 +705	403 189 407 +350

Thousands may be added the same way as hundreds, tens, and ones.

9768 Change 10 thousands
+1255 to 1 ten-thousand.
11023

Use with page 29.

	a	b	c
1.	6757 +964	333 +2677	5564 +476
2.	677 9854 +3879	9567 898 +281	458 678 +9763
3.	792 654 6983 +451	920 9860 759 +8546	7586 3250 798 +984

Use with page 30.

	a	b	c
1.	4678 +4794	5445 +4867	3273 +6988
2.	6125 4000 +9058	5137 8539 +2539	8000 9226 +6608
3.	7513 8209 4416 +6310	8507 6418 5426 +3500	6409 4310 2623 +4009
4.	5120 3012 9528 +2619	4746 2500 6002 +5448	1516 8723 5006 +6620

You can use addition to help you find the difference in a subtraction equation.

$9+2=11$ $\quad$ $11-2=9$

Use with pages 35 and 36.

	a	*b*	*c*	*d*
1.	8 +9	17 −9	8 +7	15 −7
2.	9 +8	17 −8	8 +6	14 −6
3.	9 +5	14 −5	9 +7	16 −7
4.	9 +6	15 −6	8 +8	16 −8

When there are more ones in the minuend than in the subtrahend, subtract the ones and write the tens.

$$\begin{array}{r} 36 \\ -4 \\ \hline 32 \end{array} \qquad 36-4=32$$

Use with page 41, part A.

	a	*b*	*c*	*d*
1.	29 −3	45 −4	38 −5	76 −2
2.	19 −6	37 −3	86 −4	27 −5
3.	96 −5	77 −6	49 −9	54 −1

When there are more ones in the subtrahend than in the minuend, change the form of 1 ten to 10 ones and then subtract.

$$\begin{array}{r} 22 \\ -7 \\ \hline 15 \end{array} \qquad 22-7=15$$

Use with page 41, part B.

	a	*b*	*c*	*d*
1.	75 −6	86 −9	53 −7	75 −8
2.	60 −7	23 −6	42 −8	98 −9

Subtract tens as you subtract ones, making changes in form as needed.

$$\begin{array}{r} 69 \\ -35 \\ \hline 34 \end{array} \qquad \begin{array}{r} 60 \\ -46 \\ \hline 14 \end{array}$$

Use with page 42.

	a	*b*	*c*	*d*
1.	92 −22	88 −24	56 −55	99 −57
2.	75 −23	88 −13	65 −22	43 −32
3.	87 −38	94 −54	41 −37	32 −19
4.	73 −38	94 −36	75 −59	85 −38

Subtract hundreds as you subtract tens and ones, making changes in form whenever necessary.

$$\begin{array}{r}481\\-79\\\hline 402\end{array}\qquad\begin{array}{r}200\\-67\\\hline 133\end{array}\qquad\begin{array}{r}500\\-287\\\hline 213\end{array}$$

Use with page 49.

	a	*b*	*c*	*d*
1.	761 −54	347 −29	173 −67	582 −52
2.	210 −98	682 −86	463 −75	543 −97
3.	614 −78	166 −99	714 −75	566 −88
4.	104 −95	804 −99	503 −88	607 −29

Use with page 50.

	a	*b*	*c*	*d*
1.	738 −726	695 −160	665 −234	769 −356
2.	910 −249	275 −196	622 −443	930 −448
3.	853 −679	623 −345	530 −348	760 −487
4.	560 −275	874 −279	751 −366	622 −487
5.	594 −365	772 −336	503 −276	800 −261

Subtract thousands as you subtract hundreds, tens, and ones, making changes in form whenever necessary.

$$\begin{array}{r}5140\\-469\\\hline 4671\end{array}\qquad\begin{array}{r}7102\\-5476\\\hline 1626\end{array}$$

Use with page 53.

	a	*b*	*c*
1.	6310 −324	7542 −865	9560 −979
2.	7035 −487	4831 −879	3242 −548
3.	8825 −986	2604 −936	9501 −876
4.	4900 −923	5304 −959	5801 −965

Use with page 54.

	a	*b*	*c*
1.	9624 −3646	9400 −5646	9905 −5999
2.	7814 −4889	4903 −1478	7200 −2386
3.	8515 −4578	8805 −3536	6402 −4765
4.	7510 −5826	7506 −3249	9700 −2718
5.	8418 −2459	4902 −4567	6602 −3847

Changing the order of the multiplier and the multiplicand does not change the product.

5×6=30　　6×5=30

Use with page 59.

	a	b	c	d
1.	3 ×8	8 ×3	5 ×7	7 ×5
2.	4 ×9	9 ×4	3 ×9	9 ×3
3.	4 ×7	7 ×4	6 ×7	7 ×6

Multiplying a number by 1 and 1 by a number does not change the number.

1×2=2　　2×1=2

Use with page 59.

	a	b
1.	1×9=n	9×1=n
2.	8×1=n	1×8=n

Multiply tens as you multiply ones.

4×1=4　　4×1 one=4 ones=4

4×10=40　　4×1 ten=4 tens=40

Use with page 61.

	a	b
1.	5×80=n	5×8 tens=___tens
2.	4×60=n	4×6 tens=___tens
3.	9×30=n	9×3 tens=___tens
4.	8×40=n	8×4 tens=___tens
5.	6×50=n	6×5 tens=___tens

Multiply a two-digit number by first multiplying the ones and then multiplying the tens. Add the partial products.

$$\begin{array}{r} 61 \\ \times 5 \\ \hline 5 \\ 300 \\ \hline 305 \end{array} \qquad \begin{array}{r} 28 \\ \times 3 \\ \hline 24 \\ 60 \\ \hline 84 \end{array}$$

Use with page 62.

	a	b	c	d
1.	10 ×4	31 ×3	72 ×3	74 ×2
2.	80 ×5	30 ×7	73 ×2	91 ×2
3.	21 ×9	42 ×4	60 ×3	82 ×3
4.	83 ×3	53 ×2	70 ×4	62 ×3
5.	51 ×3	90 ×2	64 ×2	43 ×3
6.	90 ×3	81 ×4	61 ×5	40 ×5

Use with page 63.

	a	*b*	*c*	*d*
1.	34 ×7	24 ×8	43 ×5	75 ×4
2.	89 ×2	67 ×3	48 ×5	58 ×3
3.	87 ×5	65 ×3	53 ×8	15 ×9
4.	23 ×6	42 ×8	65 ×4	54 ×3
5.	18 ×6	46 ×5	22 ×7	32 ×9
6.	45 ×9	99 ×3	55 ×8	89 ×4

You multiply hundreds in the same way that you multiply tens and ones.

$$\begin{array}{r}144\\ \times 2\\ \hline 288\end{array} \qquad \begin{array}{r}144\\ \times 6\\ \hline 864\end{array} \qquad \begin{array}{r}395\\ \times 6\\ \hline 2370\end{array}$$

Use with page 69.

	a	*b*	*c*	*d*
1.	231 ×3	212 ×2	242 ×2	324 ×2
2.	423 ×2	414 ×2	323 ×3	234 ×2
3.	412 ×2	330 ×3	213 ×3	202 ×4
4.	333 ×3	403 ×2	211 ×4	342 ×2

Use with page 70.

	a	*b*	*c*	*d*
1.	229 ×4	318 ×3	125 ×7	357 ×2
2.	119 ×8	248 ×3	465 ×2	219 ×4
3.	264 ×3	128 ×6	375 ×2	125 ×5
4.	176 ×3	456 ×2	133 ×4	356 ×2
5.	153 ×5	277 ×3	124 ×7	439 ×2
6.	365 ×2	143 ×6	182 ×5	228 ×4

Use with page 71.

	a	*b*	*c*	*d*
1.	215 ×4	325 ×3	119 ×5	328 ×3
2.	892 ×3	750 ×8	841 ×6	921 ×9
3.	265 ×3	356 ×2	197 ×4	456 ×2
4.	608 ×7	715 ×6	703 ×9	923 ×4
5.	823 ×5	817 ×9	293 ×7	668 ×5
6.	763 ×4	683 ×6	571 ×3	814 ×5

A fast way to divide one number by another is to use what you know about multiplication.

$5 \times 2 = 10$ $10 \div 2 = 5$

Use with pages 79 and 80.

	a	*b*	*c*	*d*
1.	$5\overline{)45}$	$6\overline{)42}$	$7\overline{)35}$	$4\overline{)36}$
2.	$6\overline{)36}$	$9\overline{)36}$	$6\overline{)30}$	$5\overline{)35}$
3.	$4\overline{)32}$	$5\overline{)30}$	$9\overline{)45}$	$7\overline{)28}$
4.	$8\overline{)40}$	$7\overline{)42}$	$8\overline{)32}$	$5\overline{)40}$

Use with pages 84 and 85.

	a	*b*
1.	$54 \div 9 = n$	$48 \div 6 = n$
2.	$48 \div n = 8$	$54 \div n = 6$
3.	$n \div 9 = 6$	$n \div 6 = 8$
4.	$49 \div 7 = n$	$56 \div n = 8$
5.	$63 \div 7 = n$	$n \div 9 = 8$

Use with pages 86 and 87.

	a	*b*
1.	$6 \times 9 = n$	$54 \div 9 = n$
2.	$8 \times 8 = n$	$64 \div 8 = n$
3.	$6 \times 8 = n$	$48 \div 8 = n$
4.	$7 \times 9 = n$	$63 \div 9 = n$
5.	$7 \times 8 = n$	$56 \div 8 = n$
6.	$9 \times 8 = n$	$72 \div 8 = n$
7.	$9 \times 9 = n$	$81 \div 9 = n$
8.	$8 \times 9 = n$	$72 \div 9 = n$

Write a remainder other than 0 at the right of the quotient.

$$\begin{array}{r} 5 \text{ r1} \\ 2\overline{)11} \\ -10 \\ \hline 1 \text{ remainder} \end{array}$$

Use with page 90.

	a	*b*	*c*	*d*
1.	$4\overline{)38}$	$5\overline{)39}$	$4\overline{)35}$	$3\overline{)26}$
2.	$5\overline{)24}$	$3\overline{)17}$	$4\overline{)23}$	$2\overline{)13}$
3.	$6\overline{)8}$	$7\overline{)9}$	$6\overline{)9}$	$7\overline{)8}$
4.	$9\overline{)75}$	$6\overline{)57}$	$8\overline{)60}$	$9\overline{)70}$
5.	$6\overline{)32}$	$7\overline{)45}$	$6\overline{)40}$	$8\overline{)20}$
6.	$7\overline{)30}$	$9\overline{)38}$	$8\overline{)34}$	$6\overline{)39}$
7.	$9\overline{)80}$	$7\overline{)48}$	$8\overline{)46}$	$7\overline{)52}$
8.	$7\overline{)59}$	$9\overline{)66}$	$6\overline{)45}$	$7\overline{)40}$
9.	$7\overline{)65}$	$9\overline{)57}$	$8\overline{)58}$	$6\overline{)20}$

Dividing a Two-Digit Dividend by a One-Digit Divisor

Divide a two-digit number by dividing the tens and then the ones, writing a remainder other than 0 at the right of the quotient.

$$\begin{array}{r} 34 \\ 2\overline{)68} \\ -6 \\ \hline 08 \\ -8 \\ \hline 0 \end{array} \qquad \begin{array}{r} 34\text{ r1} \\ 2\overline{)69}\phantom{\text{ r1}} \\ -6\phantom{\text{ r1}} \\ \hline 09\phantom{\text{ r1}} \\ -8\phantom{\text{ r1}} \\ \hline 1\phantom{\text{ r1}} \end{array}$$

Use with page 99.

	a	*b*	*c*	*d*
1.	$3\overline{)36}$	$2\overline{)84}$	$2\overline{)46}$	$2\overline{)28}$
2.	$5\overline{)55}$	$2\overline{)68}$	$3\overline{)99}$	$2\overline{)88}$

Use with page 101.

	a	*b*	*c*	*d*
1.	$3\overline{)67}$	$2\overline{)45}$	$4\overline{)49}$	$5\overline{)59}$
2.	$2\overline{)87}$	$3\overline{)95}$	$2\overline{)69}$	$4\overline{)87}$

Use with page 102.

	a	*b*	*c*	*d*
1.	$6\overline{)68}$	$3\overline{)65}$	$8\overline{)89}$	$2\overline{)47}$
2.	$5\overline{)57}$	$3\overline{)38}$	$6\overline{)69}$	$2\overline{)85}$
3.	$4\overline{)47}$	$7\overline{)79}$	$4\overline{)85}$	$2\overline{)65}$
4.	$3\overline{)94}$	$2\overline{)81}$	$3\overline{)95}$	$4\overline{)86}$

When the remainder of tens is a number other than 0 and less than the divisor, change the form of the tens to ones and add them to the ones.

$$\begin{array}{r} 24 \\ 3\overline{)72} \\ -6 \\ \hline 12 \\ -12 \\ \hline 0 \end{array} \qquad \begin{array}{r} 16\text{ r3} \\ 4\overline{)67}\phantom{\text{ r3}} \\ -4\phantom{\text{ r3}} \\ \hline 27\phantom{\text{ r3}} \\ -24\phantom{\text{ r3}} \\ \hline 3\phantom{\text{ r3}} \end{array}$$

Use with page 107.

	a	*b*	*c*	*d*
1.	$3\overline{)87}$	$7\overline{)98}$	$2\overline{)70}$	$3\overline{)72}$
2.	$2\overline{)38}$	$5\overline{)80}$	$2\overline{)58}$	$4\overline{)60}$

Use with page 108.

	a	*b*	*c*	*d*
1.	$3\overline{)57}$	$2\overline{)78}$	$5\overline{)65}$	$4\overline{)92}$
2.	$8\overline{)96}$	$3\overline{)51}$	$6\overline{)72}$	$5\overline{)90}$
3.	$2\overline{)96}$	$3\overline{)54}$	$4\overline{)76}$	$6\overline{)96}$

Use with page 109.

	a	*b*	*c*	*d*
1.	$4\overline{)65}$	$3\overline{)47}$	$2\overline{)97}$	$3\overline{)85}$
2.	$5\overline{)67}$	$6\overline{)92}$	$5\overline{)83}$	$7\overline{)95}$
3.	$3\overline{)79}$	$4\overline{)75}$	$3\overline{)71}$	$7\overline{)89}$

Using Measures

Measures that are different in form may be equal in value. The = sign is used to mean *is equivalent to.* See page 332 for tables of measure.

Use with page 115.

	a	*b*
1.	3 ft. = ? in.	5 ft. = ? in.
2.	72 in. = ? ft.	3 mi. = ? ft.
3.	5 yd. = ? in.	8 yd. = ? ft.
4.	? yd. = 60 ft.	? ft. = 10 mi.
5.	? yd. = 2 mi.	5 mi. = ? yd.

Use with page 118.

	a	*b*
1.	4 gal. = ? qt.	8 qt. = ? pt.
2.	6 gal. = ? qt.	6 qt. = ? pt.
3.	? c. = 2 gal.	? c. = 5 pt.
4.	24 pt. = ? gal.	? pt. = 10 gal.
5.	? c. = 4 gal.	4 c. = ? qt.

Use with page 119.

	a	*b*
1.	5 lb. = ? oz.	8 lb. = ? oz.
2.	9 lb. = ? oz.	7 lb. = ? oz.
3.	3 T. = ? lb.	5 T. = ? lb.
4.	1 T. = ? oz.	? lb. = 7 T.

Use with page 121.

	a	*b*
1.	5 wk. = ? da.	6 yr. = ? mo.
2.	8 yr. = ? wk.	4 yr. = ? da.
3.	? wk. = 2 yr.	12 wk. = ? da.

Use with page 123.

	a	*b*
1.	3 hr. = ? min.	3 hr. = ? sec.
2.	7 da. = ? hr.	50 min. = ? sec.
3.	? min. = 1 da.	? sec. = 2 hr.

Use with page 126.

	a	*b*
1.	5 qt. = ? pt.	8 pk. = ? qt.
2.	6 bu. = ? pk.	32 qt. = ? pk.
3.	16 qt. = ? pk.	5 bu. = ? qt.
4.	10 pt. = ? pk.	? pk. = 7 bu.

Measures can be expressed in more than one form.

2 ft. 4 in. = 28 in.

Use with page 128.

1. 3 ft. 6 in. = ? in.

2. 5 gal. 2 qt. = ? qt.

3. 2 yd. 2 ft. = ? ft.

4. 6 bu. 1 pk. = ? pk.

Problem Solving

Every problem can be expressed as an equation. You can decide whether to use the +, −, ×, or ÷ sign in your equations by reading each problem carefully to find out what was done with the sets in it.

Sally used 26 of the 50 sheets of paper in a package. How many sheets of paper did she use?

$$50-26=n$$
$$50-26=24$$

Sally used 24 sheets of paper.

Use with pages 134 through 136.

Express each problem below as an equation. Solve the equation. Write the answer.

1. Larry wanted to buy an ice cream soda that cost \$.25. He had only \$.19 in his pocket. How much more money did he need?

2. Jane had 17 books and Betty had 19 books. How many books did the girls have together?

3. Betty had 24 eggs, which she wanted to put into boxes that held 6 eggs each. How many boxes did she need?

4. Dick can put 26 reading books on each shelf. He has 4 shelves. How many books will the shelves hold?

Problems that are solved by using more than one operation can be expressed in a single equation.

Ann had 35 buttons. Her aunt gave her 19 buttons. Then Ann gave 10 buttons to Betsy. How many buttons did Ann have left?

$$(35+19)-10=n$$
$$54-10=n$$
$$44=n$$

The answer is 44 buttons.

Use with pages 137 through 141.

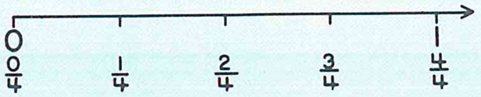
1. Arthur plans to buy a bicycle that costs \$37.50. He saved \$19.75, and his uncle gave him \$10.00. How much more money does he need?

2. Nancy had \$.95. She spent \$.25 for candy, \$.19 for paper, and \$.15 for an ice cream cone. How much money did she have left?

3. Dick had 6 bags of apples with 9 pounds of apples in each bag and a basket of apples that weighed 15 pounds. How many pounds of apples did he have altogether?

4. In one school there were 9 classrooms with 32 seats in each, and a music room with 36 seats in it. How many seats were in the classrooms and the music room together?

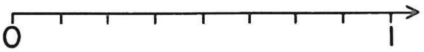
A fraction is used as the number name of a fractional number. It consists of 2 numerals, one above the other, separated by a fraction line.



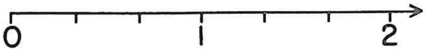
Use with pages 153 and 154.

Make drawings like the ones below. Write the correct fraction below each mark on your drawing.

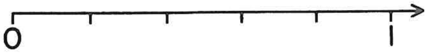
1.



2.



3.



Find $\frac{2}{3}$ or $\frac{3}{4}$ of a number by dividing that number by the number named below the fraction line and multiplying that value by the number named above the fraction line.

$\frac{2}{3}$ of $12 = 2 \times (\frac{1}{3}$ of $12) = 2 \times (12 \div 3) = 2 \times 4 = 8$

Use with pages 158 and 159.

	a	*b*
1.	$\frac{2}{3}$ of 24 = ___	$\frac{2}{3}$ of 75 = ___
2.	$\frac{3}{4}$ of 92 = ___	$\frac{3}{4}$ of 48 = ___
3.	$\frac{2}{3}$ of 36 = ___	$\frac{3}{4}$ of 72 = ___

A remainder may be expressed as a fraction.

$$\begin{array}{r} 3\text{ r}1 \\ 3\overline{)10} \\ \underline{9} \\ 1 \end{array} \quad \text{or} \quad \begin{array}{r} 3\frac{1}{3} \\ 3\overline{)10} \\ \underline{9} \\ 1 \end{array}$$

Use with page 161.

Copy, using the sign $\overline{)\ \ }$. Solve.

	a	*b*
1.	$38 \div 3 = n$	$47 \div 3 = n$
2.	$46 \div 4 = n$	$57 \div 2 = n$
3.	$94 \div 7 = n$	$61 \div 5 = n$
4.	$41 \div 4 = n$	$92 \div 6 = n$
5.	$69 \div 4 = n$	$48 \div 5 = n$
6.	$72 \div 5 = n$	$86 \div 6 = n$

Fractions that are different in form may express the same value.

$\frac{1}{2} = \frac{2}{4}$

Use with pages 163 through 165.

	a	*b*	*c*	*d*
1.	$1 = \frac{n}{5}$	$1 = \frac{n}{3}$	$1 = \frac{n}{8}$	$1 = \frac{5}{n}$
2.	$\frac{1}{2} = \frac{n}{12}$	$\frac{1}{2} = \frac{n}{16}$	$\frac{1}{2} = \frac{n}{20}$	$\frac{1}{7} = \frac{2}{n}$
3.	$\frac{1}{2} = \frac{6}{n}$	$\frac{1}{2} = \frac{9}{n}$	$\frac{1}{2} = \frac{12}{n}$	$\frac{1}{8} = \frac{3}{n}$
4.	$\frac{1}{4} = \frac{n}{24}$	$\frac{1}{4} = \frac{n}{20}$	$\frac{1}{4} = \frac{6}{n}$	$\frac{1}{9} = \frac{n}{27}$
5.	$\frac{1}{3} = \frac{n}{6}$	$\frac{1}{6} = \frac{n}{6}$	$\frac{1}{3} = \frac{n}{12}$	$\frac{1}{3} = \frac{5}{n}$

Multiplying by One-Digit Numbers and Two-Digit Numbers

You multiply thousands, hundreds, tens, and ones separately. Then you add the partial products.

	TTh	Th	H	T	O
		7	5	6	8
				×	7
7 O×8 O =56 O=				5	6
7 O×6 T =42 T=			4	2	0
7 O×5 H =35 H=		3	5	0	0
7 O×7 Th=49 Th=	4	9	0	0	0
The sum is	5	2	9	7	6

Use with pages 176 and 177.

	a	*b*	*c*	*d*
1.	2840 ×3	5610 ×4	4318 ×2	2312 ×4
2.	2162 ×4	8232 ×2	3120 ×3	4361 ×5
3.	6347 ×2	5118 ×5	8063 ×3	5014 ×6
4.	6312 ×4	2924 ×3	3254 ×9	9764 ×4
5.	4975 ×8	6583 ×7	8534 ×5	6750 ×6
6.	3956 ×7	6245 ×5	8643 ×4	7856 ×2
7.	2619 ×8	9738 ×5	7586 ×3	8341 ×9
8.	9365 ×5	4652 ×7	6348 ×2	5867 ×4

You multiply by tens in the same way that you multiply by ones.

	H	T	O
		2	4
	×	1	2
2 O×4 O=8 O=			8
2 O×2 T=4 T=		4	0
1 T×4 O=4 T=		4	0
1 T×2 T=2 H=	2	0	0
Add	2	8	8

Use with page 181.

	a	*b*	*c*	*d*
1.	20 ×30	10 ×50	30 ×20	40 ×10
2.	10 ×10	10 ×20	34 ×20	31 ×30
3.	44 ×20	39 ×10	11 ×20	47 ×10

Use with page 182.

	a	*b*	*c*	*d*
1.	10 ×86	20 ×24	10 ×67	20 ×23
2.	10 ×79	20 ×41	10 ×94	20 ×11
3.	10 ×59	10 ×32	22 ×33	23 ×21
4.	69 ×11	24 ×12	21 ×31	43 ×12
5.	12 ×21	11 ×38	12 ×33	22 ×32

Making Changes in the Form of Partial Products

You change the form of a partial product whenever the digit in any place-value position is greater than 9.

	Th	H	T	O
			8	4
		×	4	8
8 O×4 O=32 O=			3	2
8 O×8 T=64 T=		6	4	0
4 T×4 O=16 T=		1	6	0
4 T×8 T=32 H=	3	2	0	0
Add	4	0	3	2

Use with page 183.

	a	b	c	d
1.	28 ×31	14 ×72	48 ×21	13 ×62
2.	39 ×21	12 ×51	18 ×41	23 ×43
3.	24 ×32	17 ×41	13 ×37	19 ×15

Use with page 184.

	a	b	c	d
1.	13 ×62	46 ×21	12 ×81	37 ×21
2.	18 ×21	16 ×31	23 ×42	26 ×31
3.	34 ×32	29 ×31	37 ×12	13 ×25
4.	12 ×47	24 ×24	23 ×34	13 ×26

Use with page 185.

	a	b	c	d
1.	73 ×12	32 ×14	43 ×13	50 ×18
2.	21 ×45	30 ×26	50 ×19	31 ×17
3.	21 ×16	32 ×24	32 ×39	43 ×29

Use with page 186.

	a	b	c	d
1.	29 ×42	12 ×98	35 ×32	29 ×73
2.	45 ×42	28 ×52	19 ×73	75 ×21
3.	33 ×42	47 ×31	26 ×72	37 ×32

Use with page 187.

	a	b	c	d
1.	61 ×87	62 ×82	73 ×63	20 ×99
2.	72 ×44	81 ×47	31 ×48	90 ×57
3.	52 ×82	71 ×33	71 ×72	82 ×63
4.	91 ×45	40 ×97	83 ×62	72 ×32

Dividing a Three-Digit Number by a One-Digit Number

You divide hundreds as you divide tens and ones.

$$\begin{array}{r}
132\\
3\overline{)396}\\
\underline{3}\\
09\\
\underline{9}\\
06\\
\underline{6}\\
0
\end{array}
\qquad
\begin{array}{rl}
230 & \text{r1}\\
3\overline{)691} & \\
\underline{6} & \\
09 & \\
\underline{9} & \\
01 &
\end{array}$$

Use with page 192.

	a	*b*	*c*
1.	$3\overline{)936}$	$2\overline{)826}$	$4\overline{)844}$
2.	$3\overline{)696}$	$2\overline{)487}$	$4\overline{)449}$
3.	$5\overline{)559}$	$3\overline{)698}$	$7\overline{)779}$

When the digit in tens place is less than the divisor, you change the form of 1 ten to 10 ones.

$$\begin{array}{r}
205\\
4\overline{)820}\\
\underline{8}\\
20\\
\underline{20}\\
0
\end{array}
\qquad
\begin{array}{rl}
205 & \text{r1}\\
4\overline{)821} & \\
\underline{8} & \\
21 & \\
\underline{20} & \\
1 &
\end{array}$$

Use with page 193.

	a	*b*	*c*
1.	$7\overline{)799}$	$6\overline{)695}$	$8\overline{)899}$
2.	$5\overline{)592}$	$2\overline{)637}$	$3\overline{)955}$
3.	$4\overline{)478}$	$2\overline{)497}$	$3\overline{)979}$

	a	*b*	*c*
4.	$2\overline{)639}$	$6\overline{)675}$	$4\overline{)870}$
5.	$4\overline{)436}$	$3\overline{)918}$	$5\overline{)540}$
6.	$2\overline{)814}$	$3\overline{)624}$	$7\overline{)763}$
7.	$7\overline{)756}$	$4\overline{)824}$	$9\overline{)972}$
8.	$3\overline{)327}$	$5\overline{)515}$	$2\overline{)410}$
9.	$2\overline{)613}$	$9\overline{)950}$	$4\overline{)415}$

When the digit in hundreds place is less than the divisor, change the form of hundreds to tens.

$$\begin{array}{r}
40\\
4\overline{)160}\\
\underline{16}\\
0\\
\underline{0}\\
0
\end{array}
\qquad
\begin{array}{rl}
30 & \text{r3}\\
4\overline{)123} & \\
\underline{12} & \\
3 & \\
\underline{0} & \\
3 &
\end{array}$$

Use with page 194.

	a	*b*	*c*
1.	$7\overline{)490}$	$4\overline{)360}$	$7\overline{)280}$
2.	$9\overline{)270}$	$6\overline{)360}$	$3\overline{)150}$
3.	$9\overline{)630}$	$5\overline{)450}$	$9\overline{)810}$
4.	$3\overline{)240}$	$8\overline{)560}$	$7\overline{)420}$
5.	$5\overline{)400}$	$9\overline{)720}$	$6\overline{)540}$
6.	$7\overline{)350}$	$3\overline{)210}$	$4\overline{)160}$

More Division with Three-Digit Dividends

You change the form of hundreds to tens and tens to ones when the digit being divided is less than the divisor.

$$\begin{array}{r} 62 \\ 4\overline{)248} \\ \underline{24} \\ 8 \\ \underline{8} \\ 0 \end{array} \qquad \begin{array}{r} 77 \\ 6\overline{)462} \\ \underline{42} \\ 42 \\ \underline{42} \\ 0 \end{array} \qquad \begin{array}{r} 76 \text{ r3} \\ 6\overline{)459} \\ \underline{42} \\ 39 \\ \underline{36} \\ 3 \end{array}$$

Use with page 195.

	a	*b*	*c*
1.	$7\overline{)287}$	$5\overline{)455}$	$3\overline{)219}$
2.	$7\overline{)497}$	$2\overline{)168}$	$4\overline{)208}$
3.	$6\overline{)366}$	$2\overline{)186}$	$8\overline{)408}$
4.	$5\overline{)305}$	$3\overline{)276}$	$2\overline{)148}$
5.	$8\overline{)728}$	$3\overline{)249}$	$7\overline{)357}$
6.	$2\overline{)128}$	$5\overline{)255}$	$6\overline{)546}$
7.	$6\overline{)426}$	$7\overline{)567}$	$4\overline{)448}$
8.	$3\overline{)159}$	$8\overline{)648}$	$5\overline{)355}$
9.	$9\overline{)817}$	$7\overline{)423}$	$5\overline{)459}$

Use with page 196.

	a	*b*	*c*
1.	$2\overline{)198}$	$5\overline{)270}$	$8\overline{)192}$
2.	$4\overline{)300}$	$2\overline{)114}$	$7\overline{)245}$
3.	$8\overline{)344}$	$7\overline{)504}$	$2\overline{)170}$
4.	$3\overline{)204}$	$9\overline{)666}$	$4\overline{)220}$
5.	$9\overline{)405}$	$3\overline{)177}$	$4\overline{)348}$
6.	$8\overline{)296}$	$6\overline{)552}$	$2\overline{)158}$
7.	$9\overline{)705}$	$5\overline{)139}$	$4\overline{)298}$
8.	$7\overline{)369}$	$3\overline{)119}$	$6\overline{)273}$
9.	$8\overline{)276}$	$4\overline{)330}$	$5\overline{)372}$

Use with page 197.

	a	*b*	*c*
1.	$2\overline{)700}$	$7\overline{)840}$	$4\overline{)760}$
2.	$5\overline{)800}$	$2\overline{)860}$	$6\overline{)780}$
3.	$6\overline{)843}$	$4\overline{)682}$	$2\overline{)541}$
4.	$6\overline{)905}$	$3\overline{)871}$	$5\overline{)753}$
5.	$6\overline{)846}$	$5\overline{)655}$	$3\overline{)729}$
6.	$4\overline{)604}$	$2\overline{)764}$	$7\overline{)917}$
7.	$4\overline{)924}$	$3\overline{)579}$	$6\overline{)966}$
8.	$5\overline{)855}$	$4\overline{)768}$	$3\overline{)846}$
9.	$4\overline{)792}$	$7\overline{)959}$	$3\overline{)747}$
10.	$8\overline{)767}$	$6\overline{)237}$	$4\overline{)311}$

Dividing a Four-Digit Dividend by a One-Digit Divisor

Thousands are divided in the same way as hundreds, tens, and ones.

$$\begin{array}{r@{}cccc}
 & 3&2&1&3\\ \cline{2-5}
3\big) & 9&6&3&9\\
 & 9&&&\\ \cline{2-2}
 & &6&&\\
 & &6&&\\ \cline{3-3}
 & &&3&\\
 & &&3&\\ \cline{4-4}
 & &&&9\\
 & &&&9\\ \cline{5-5}
 & &&&0
\end{array}
\qquad
\begin{array}{r@{}ccccl}
 & 4&2&4&1&\ \text{r}1\\ \cline{2-6}
2\big) & 8&4&8&3&\\
 & 8&&&&\\ \cline{2-2}
 & &4&&&\\
 & &4&&&\\ \cline{3-3}
 & &&8&&\\
 & &&8&&\\ \cline{4-4}
 & &&&3&\\
 & &&&2&\\ \cline{5-5}
 & &&&1&
\end{array}$$

You change the form of thousands to hundreds, hundreds to tens, and tens to ones when the digit being divided is less than the divisor.

$$\begin{array}{r@{}cccc}
 & &7&8&9\\ \cline{2-5}
6\big) & 4&7&3&4\\
 & 4&2&&\\ \cline{2-3}
 & &5&3&\\
 & &4&8&\\ \cline{3-4}
 & &&5&4\\
 & &&5&4\\ \cline{4-5}
 & &&&0
\end{array}
\qquad
\begin{array}{r@{}ccccl}
 & &5&2&4&\ \text{r}7\\ \cline{2-6}
9\big) & 4&7&2&3&\\
 & 4&5&&&\\ \cline{2-3}
 & &2&2&&\\
 & &1&8&&\\ \cline{3-4}
 & &&4&3&\\
 & &&3&6&\\ \cline{4-5}
 & &&&7&
\end{array}$$

✓ Use with page 206.

	a	*b*	*c*
1.	$3\overline{)3696}$	$2\overline{)6284}$	$4\overline{)4488}$
2.	$2\overline{)8646}$	$3\overline{)9669}$	$4\overline{)8848}$
3.	$2\overline{)4847}$	$4\overline{)8445}$	$5\overline{)5557}$
4.	$3\overline{)9698}$	$8\overline{)8889}$	$3\overline{)9395}$
5.	$5\overline{)5501}$	$7\overline{)7071}$	$4\overline{)8043}$

Use with page 207.

X

	a	*b*
1.	$1555 \div 5 = n$	$7290 \div 9 = n$
2.	$3684 \div 4 = n$	$1293 \div 3 = n$
3.	$1042 \div 2 = n$	$2480 \div 4 = n$
4.	$2845 \div 4 = n$	$1567 \div 3 = n$
5.	$4265 \div 6 = n$	$4883 \div 8 = n$
6.	$4088 \div 5 = n$	$630 \div 7 = n$

Use with page 208.

	a	*b*	*c*
1.	$3\overline{)2949}$	$5\overline{)3450}$	$7\overline{)6797}$
2.	$9\overline{)5043}$	$8\overline{)4921}$	$6\overline{)4508}$
3.	$4\overline{)1925}$	$6\overline{)5640}$	$7\overline{)4069}$
4.	$4\overline{)2724}$	$8\overline{)4969}$	$5\overline{)1958}$
5.	$6\overline{)2765}$	$9\overline{)4779}$	$9\overline{)2883}$

Use with page 209.

	a	*b*
1.	$4793 \div 3 = n$	$4998 \div 6 = n$
2.	$3900 \div 4 = n$	$2598 \div 8 = n$
3.	$4755 \div 5 = n$	$1239 \div 3 = n$
4.	$4905 \div 5 = n$	$n \times 5 = 4905$
5.	$6573 \div 7 = n$	$7 \times n = 6573$
6.	$3415 \div 4 = n$	$4 \times n = 3415$

Multiplying Three-Digit Numbers by Two-Digit Numbers

Multiplying hundreds by tens gives a product of thousands.

10×100=1000   1 T×1 H= 1 Th
40×200=8000   4 T×2 H= 8 Th
60×400=24000   6 T×4 H=24 Th

Use with page 220.

	a	*b*	*c*	*d*
1.	121 ×61	272 ×31	141 ×41	131 ×62
2.	121 ×51	233 ×43	242 ×42	121 ×16
3.	133 ×53	164 ×21	292 ×31	141 ×26
4.	261 ×31	233 ×42	162 ×31	140 ×14
5.	373 ×21	121 ×81	464 ×21	120 ×15

You will usually write only two partial products when you multiply by a two-digit number.

$$\begin{array}{r} 211 \\ \times 23 \\ \hline 633 \\ 422 \\ \hline 4853 \end{array}$$

Use with page 221.

	a	*b*	*c*	*d*
1.	302 ×32	110 ×71	103 ×33	241 ×12
2.	835 ×19	948 ×17	131 ×78	324 ×38
3.	364 ×29	482 ×27	325 ×38	862 ×14
4.	263 ×39	496 ×27	249 ×46	214 ×61
5.	328 ×36	227 ×48	471 ×24	409 ×92
6.	429 ×25	245 ×45	867 ×14	328 ×42

Use with page 222.

	a	*b*	*c*	*d*
1.	622 ×29	864 ×72	927 ×27	289 ×93
2.	461 ×83	825 ×27	956 ×53	258 ×53
3.	321 ×45	743 ×27	538 ×28	497 ×82
4.	634 ×25	726 ×29	532 ×77	289 ×73
5.	273 ×49	925 ×45	628 ×38	486 ×42
6.	737 ×26	729 ×39	777 ×37	147 ×92

Multiplying Three-Digit Numbers by Three-Digit Numbers

The product of ones and hundreds is hundreds, of tens and hundreds is thousands, and of hundreds and hundreds is ten-thousands.

$100 \times 1 = 100$ $200 \times 20 = 4000$

$300 \times 300 = 90,000$ $3\text{ H} \times 3\text{ H} = 9\text{ TTh}$

Use with page 225.

	a	b	c	d
1.	300 ×100	500 ×200	700 ×400	200 ×900
2.	400 ×800	900 ×600	800 ×700	600 ×700

Use with page 227.

	a	b	c	d
1.	318 ×500	242 ×400	776 ×900	549 ×700
2.	191 ×300	429 ×200	853 ×600	921 ×800

You multiply by hundreds as you multiply by tens or by ones.

$$\begin{array}{r} 175\\ \times 237\\ \hline 1225\\ 525\\ 350\\ \hline 41475 \end{array}$$

Use with page 229.

	a	b	c	d
1.	492 ×583	825 ×327	153 ×414	347 ×254
2.	914 ×792	586 ×635	378 ×246	689 ×324
3.	673 ×915	247 ×864	531 ×178	536 ×478
4.	421 ×247	159 ×533	382 ×716	969 ×875

Partial products may be omitted when you multiply by 0.

$$\begin{array}{r} 442\\ \times 201\\ \hline 442\\ 8840\\ \hline 88842 \end{array} \qquad \begin{array}{r} 324\\ \times 220\\ \hline 6480\\ 648\\ \hline 71280 \end{array} \qquad \begin{array}{r} 694\\ \times 400\\ \hline 277600 \end{array}$$

Use with page 230.

	a	b	c	d
1.	532 ×102	164 ×205	425 ×910	138 ×632
2.	253 ×200	416 ×607	348 ×102	460 ×372
3.	977 ×403	601 ×350	109 ×800	209 ×584
4.	781 ×500	290 ×640	830 ×703	570 ×491
5.	469 ×610	517 ×709	381 ×825	322 ×340

To Find This Number	Use This Operation
How many in all of the unequal groups	addition
How many in all of the equal groups	multiplication
How many are left	subtraction
By how many one set differs from another	subtraction
How many in each equal group	division
How many equal groups	division

Problem Solving

Express each problem below as an equation. Solve the equation. Write the answer for each problem.

Use with Chapter 14.

1. A farmer set out 9 rows of apple trees with 12 trees in each row. If each tree cost $.75, how much did all the trees cost?

2. A trip to the zoo cost $4.32. If four boys shared the cost equally, what was each boy's share?

3. Alice's father pulled carrots and tied them into bunches. He tied 44 bunches in the morning and 36 bunches in the afternoon. He sold the carrots at 12¢ a bunch. How much money did he get for them?

4. Ruth bought 5 yards of cloth at 61¢ a yard. How much change did she get from $4.00?

5. Judy put $1.85 in the bank in September, $1.35 in October, $.98 in November, and $.81 in December. How much money did she save in four months?

6. Bill has $23.80. If he saves 25¢ a week for 9 weeks, how much will he have saved altogether?

7. Mrs. Jackson paid $3.21 for 3 pounds of meat. What was the price of the meat per pound?

8. Paul's father bought 3 shirts for $9.75. How much did each shirt cost?

9. Paul's father paid for the shirts with a $20 bill. How much change should he have received?

10. John's father wants to buy 50 feet of plastic garden hose. At 17¢ a foot, how much will the hose cost?

11. Betty's mother is 5 ft. 7 in. tall. Betty is 57 in. tall. What is the difference between their heights?

12. Fred had $1.75 and earned $.85. Then he spent $.78 for paints. How much money did he have left?

Circles, Squares, Rectangles, and Triangles

Dimensions may be expressed in different kinds of units.

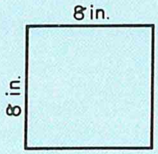
1 ft. 9 in. may be expressed as 21 in.

2 yd. 2 ft. may be expressed as 8 ft.

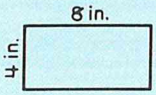
Use with page 251.

1. 1 ft. 6 in. = ___ in.
2. 5 ft. 1 in. = ___ in.
3. 8 yd. 2 ft. = ___ ft.
4. 4 mi. 350 yd. = ___ yd.

Find the perimeter of a square, rectangle, or triangle by finding the distance around it.



4 X 8 = 32
The perimeter is 32 inches.



2 X (4 + 8) = 2 X 12 = 24
The perimeter is 24 inches.

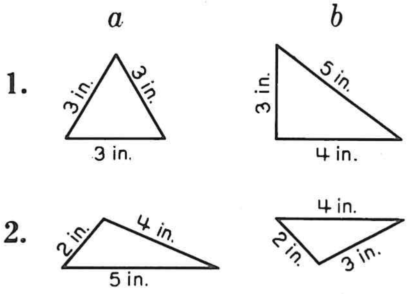
Use with page 252.

Copy. Complete the chart below.

Figure	Dimensions	Perimeter
Square	6 in.	______
Square	9 in.	______
Rectangle	3 in. by 4 in.	______
Rectangle	2 in. by 5 in.	______
Rectangle	4 in. by 7 in.	______

Use with page 253.

Write each perimeter.



A unit of measure on a drawing may represent a different unit of measure on an object.

$\frac{1}{4}$ in. may represent 1 ft.

Use with pages 255 and 256.

Using a scale, where $\frac{1}{4}$ in. represents 1 mi., give the length represented by each line below.

1. line $\frac{3}{8}$ in. long
2. line 1 in. long
3. line 2 in. long
4. line $1\frac{1}{2}$ in. long
5. line $2\frac{1}{4}$ in. long
6. line $1\frac{1}{8}$ in. long
7. line $2\frac{1}{2}$ in. long
8. line $1\frac{3}{8}$ in. long
9. line $1\frac{1}{4}$ in. long

Adding Fractional Numbers

The top numeral in a fraction stands for a number called the numerator and the bottom numeral stands for a number called the denominator.

$$\frac{2}{3}\;\begin{matrix}\text{numerator}\\ \text{denominator}\end{matrix}$$

Use with page 264.

Write each of the following pairs of numerals as fractions, using the larger of the numerals in each pair as a denominator.

	a	*b*	*c*	*d*
1.	3, 4	5, 6	8, 7	9, 2
2.	3, 2	4, 7	16, 5	5, 8
3.	16, 3	5, 32	7, 9	17, 10

In an addition using fractions having a common denominator, write the sum of the numerators over the common denominator.

$\frac{1}{3}+\frac{1}{3}=n$ becomes $\frac{1+1}{3}=\frac{2}{3}$

Use with page 265.

	a	*b*	*c*
1.	$\frac{3}{5}+\frac{1}{5}=n$	$n+\frac{1}{5}=\frac{4}{5}$	$\frac{3}{5}+n=\frac{4}{5}$
2.	$\frac{2}{5}+\frac{2}{5}=n$	$n+\frac{2}{5}=\frac{4}{5}$	$\frac{1}{5}+\frac{3}{5}=n$
3.	$\frac{2}{5}+n=\frac{4}{5}$	$\frac{1}{5}+\frac{1}{5}=n$	$n+\frac{1}{5}=\frac{2}{5}$
4.	$\frac{3}{7}+\frac{1}{7}=n$	$n+\frac{1}{7}=\frac{4}{7}$	$\frac{1}{7}+\frac{3}{7}=n$
5.	$\frac{5}{9}+\frac{3}{9}=n$	$\frac{1}{9}+\frac{6}{9}=n$	$\frac{5}{16}+\frac{2}{16}=n$

Use with page 266.

	a	*b*
1.	$\frac{3}{7}+\frac{1}{7}+\frac{2}{7}=n$	$\frac{1}{16}+\frac{7}{16}+\frac{5}{16}=n$
2.	$\frac{3}{16}+\frac{5}{16}+\frac{7}{16}=n$	$\frac{3}{12}+\frac{4}{12}+\frac{4}{12}=n$
3.	$\frac{1}{8}+\frac{3}{8}+\frac{1}{8}=n$	$\frac{5}{24}+\frac{8}{24}+\frac{6}{24}=n$
4.	$\frac{12}{32}+\frac{14}{32}+\frac{3}{32}=n$	$\frac{7}{16}+\frac{3}{16}+\frac{5}{16}=n$

You change the form of a fraction to lowest terms by dividing the numerator and the denominator by the same number.

$$\frac{4}{8}\div 1=\frac{4}{8}\div\frac{4}{4}=\frac{4\div 4}{8\div 4}=\frac{1}{2}$$

$$\frac{8}{8}\div 1=\frac{8\div 8}{8\div 8}=\frac{1}{1}=1$$

Use with page 268. Reduce to lowest terms.

	a	*b*	*c*
1.	$\frac{2}{6}+\frac{1}{6}=n$	$\frac{3}{10}+\frac{3}{10}=n$	$\frac{4}{15}+\frac{2}{15}=n$
2.	$\frac{4}{12}+\frac{2}{12}=n$	$\frac{3}{16}+\frac{1}{16}=n$	$\frac{5}{9}+\frac{1}{9}=n$
3.	$\frac{5}{16}+\frac{5}{16}=n$	$\frac{7}{16}+\frac{5}{16}=n$	$\frac{4}{12}+\frac{6}{12}=n$

Use with page 269.

	a	*b*
1.	$\frac{5}{12}+\frac{7}{12}=n$	$\frac{1}{16}+\frac{7}{16}=n$
2.	$\frac{3}{16}+\frac{5}{16}+\frac{8}{16}=n$	$\frac{2}{16}+\frac{5}{16}+\frac{5}{16}=n$
3.	$\frac{8}{12}+\frac{3}{12}+\frac{1}{12}=n$	$\frac{2}{10}+\frac{3}{10}+\frac{5}{10}=n$
4.	$\frac{4}{16}+\frac{1}{16}+\frac{5}{16}=n$	$\frac{1}{3}+\frac{1}{3}+\frac{1}{3}=n$

More Practice in Adding Fractional Numbers

When the sum is an improper fraction, change its form to a mixed fraction.

$$\frac{5}{6}+\frac{5}{6}=\frac{5+5}{6}=\frac{10}{6}=\frac{6+4}{6}=\frac{6}{6}+\frac{4}{6}=1+\frac{4}{6}=1+\frac{2}{3}=1\frac{2}{3}$$

Use with page 271.

	a	*b*
1.	$\frac{9}{10}+\frac{2}{10}=n$	$\frac{9}{16}+\frac{8}{16}=n$
2.	$\frac{3}{5}+\frac{1}{5}+\frac{2}{5}=n$	$\frac{3}{9}+\frac{7}{9}+\frac{1}{9}=n$
3.	$\frac{3}{12}+\frac{6}{12}+\frac{8}{12}=n$	$\frac{7}{16}+\frac{5}{16}+\frac{9}{16}=n$
4.	$\frac{4}{32}+\frac{25}{32}+\frac{10}{32}=n$	$\frac{9}{20}+\frac{3}{20}+\frac{9}{20}=n$
5.	$\frac{13}{16}+\frac{1}{16}+\frac{5}{16}=n$	$\frac{7}{10}+\frac{8}{10}+\frac{4}{10}=n$
6.	$\frac{3}{12}+\frac{7}{12}+\frac{11}{12}=n$	$\frac{3}{16}+\frac{7}{16}+\frac{9}{16}=n$
7.	$\frac{5}{16}+\frac{7}{16}+\frac{15}{16}=n$	$\frac{3}{8}+\frac{7}{8}+\frac{1}{8}=n$

Use with page 272.

Write these equations in column form. Find each sum.

	a	*b*
1.	$\frac{5}{7}+\frac{11}{7}=n$	$\frac{1}{6}+\frac{5}{6}+\frac{5}{6}=n$
2.	$\frac{8}{9}+\frac{5}{9}=n$	$\frac{7}{8}+\frac{3}{8}+\frac{7}{8}=n$
3.	$\frac{13}{16}+\frac{9}{16}=n$	$\frac{11}{16}+\frac{5}{16}+\frac{15}{16}=n$
4.	$\frac{2}{3}+\frac{2}{3}=n$	$\frac{1}{3}+\frac{2}{3}+\frac{2}{3}=n$
5.	$\frac{6}{7}+\frac{5}{7}=n$	$\frac{1}{7}+\frac{6}{7}+\frac{2}{7}=n$
6.	$\frac{9}{13}+\frac{11}{13}=n$	$\frac{5}{13}+\frac{10}{13}+\frac{12}{13}=n$
7.	$\frac{4}{11}+\frac{9}{11}=n$	$\frac{3}{11}+\frac{10}{11}+\frac{10}{11}=n$

In an addition using mixed fractions, add the fractional numbers first, then add the whole numbers.

$$\begin{array}{r} \frac{1}{3} \\ +4\frac{1}{3} \\ \hline 4\frac{2}{3} \end{array} \qquad \begin{array}{r} 2\frac{5}{8} \\ +2\frac{7}{8} \\ \hline 4\frac{12}{8} \end{array}=4+1\frac{4}{8}=5\frac{4}{8}=5\frac{1}{2}$$

Use with page 275.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 7\frac{1}{8} \\ +\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{4} \\ +8\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{5}{10} \\ +\frac{3}{10} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{5}{12} \\ +\frac{4}{12} \\ \hline \end{array}$
2.	$\begin{array}{r} 12\frac{1}{5} \\ +\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 15\frac{1}{6} \\ +\frac{5}{6} \\ \hline \end{array}$	$\begin{array}{r} 14\frac{2}{7} \\ +\frac{5}{7} \\ \hline \end{array}$	$\begin{array}{r} 18\frac{1}{9} \\ +\frac{2}{9} \\ \hline \end{array}$

Use with page 276.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 7\frac{2}{13} \\ +\frac{9}{13} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{15}{32} \\ +\frac{17}{32} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{6}{25} \\ +\frac{9}{25} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{4}{14} \\ +\frac{9}{14} \\ \hline \end{array}$
2.	$\begin{array}{r} 5\frac{5}{12} \\ +\frac{7}{12} \\ \hline \end{array}$	$\begin{array}{r} \frac{9}{17} \\ +2\frac{10}{17} \\ \hline \end{array}$	$\begin{array}{r} \frac{12}{19} \\ +9\frac{11}{19} \\ \hline \end{array}$	$\begin{array}{r} 10\frac{5}{6} \\ +\frac{2}{6} \\ \hline \end{array}$

Use with page 277.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 11\frac{9}{10} \\ +7\frac{3}{10} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{3} \\ +8\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{7}{9} \\ +17\frac{7}{9} \\ \hline \end{array}$	$\begin{array}{r} 19\frac{2}{5} \\ +11\frac{4}{5} \\ \hline \end{array}$
2.	$\begin{array}{r} 13\frac{2}{15} \\ +2\frac{7}{15} \\ \hline \end{array}$	$\begin{array}{r} 10\frac{1}{4} \\ +7\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{7}{10} \\ +5\frac{7}{10} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{1}{4} \\ +8\frac{3}{4} \\ \hline \end{array}$
3.	$\begin{array}{r} 17\frac{17}{25} \\ 19\frac{3}{25} \\ +3\frac{5}{25} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{11} \\ 4\frac{3}{11} \\ +3\frac{2}{11} \\ \hline \end{array}$	$\begin{array}{r} 10\frac{1}{3} \\ 40\frac{2}{3} \\ +60\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{10}{19} \\ 4\frac{8}{19} \\ +10\frac{2}{19} \\ \hline \end{array}$

Subtracting Fractional Numbers

In a subtraction using fractions having a common denominator, write the difference of the numerators over the common denominator. Reduce to lowest terms.

$$\frac{5}{7}-\frac{2}{7}=\frac{5-2}{7}=\frac{3}{7}$$

Use with pages 284 and 285.

	a	*b*	*c*
1.	$\frac{3}{5}-\frac{1}{5}=n$	$\frac{2}{7}-\frac{1}{7}=n$	$\frac{3}{6}-\frac{2}{6}=n$
2.	$\frac{2}{6}-\frac{1}{6}=n$	$\frac{4}{6}-\frac{3}{6}=n$	$\frac{5}{6}-\frac{3}{6}=n$
3.	$\frac{4}{5}-\frac{2}{5}=n$	$\frac{3}{7}-\frac{2}{7}=n$	$\frac{4}{5}-\frac{1}{5}=n$
4.	$\frac{3}{6}-\frac{1}{6}=n$	$\frac{5}{8}-\frac{3}{8}=n$	$\frac{6}{9}-\frac{3}{9}=n$
5.	$\frac{6}{8}-\frac{2}{8}=n$	$\frac{9}{10}-\frac{1}{10}=n$	$\frac{11}{12}-\frac{3}{12}=n$

In a subtraction using mixed fractions, subtract the fractional numbers first and then the whole numbers.

$$\begin{array}{r} 5\frac{7}{8} \\ -1\frac{1}{8} \\ \hline 4\frac{6}{8}=4\frac{3}{4} \end{array} \qquad \begin{array}{rcr} 1 & = & \frac{6}{6} \\ -\frac{5}{6} & = & \frac{5}{6} \\ \hline & & \frac{1}{6} \end{array} \qquad \begin{array}{rcr} 2\frac{1}{5} & = & 1\frac{6}{5} \\ -1\frac{3}{5} & = & 1\frac{3}{5} \\ \hline & & \frac{3}{5} \end{array}$$

Use with page 286.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 6\frac{7}{8} \\ -\frac{6}{8} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{8}{9} \\ -\frac{6}{9} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{6}{7} \\ -\frac{5}{7} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{5}{6} \\ -\frac{5}{6} \\ \hline \end{array}$
2.	$\begin{array}{r} 4\frac{3}{9} \\ -3\frac{1}{9} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{6}{8} \\ -2\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{4}{8} \\ -1\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{4}{5} \\ -3\frac{4}{5} \\ \hline \end{array}$
3.	$\begin{array}{r} 11\frac{4}{9} \\ -7\frac{3}{9} \\ \hline \end{array}$	$\begin{array}{r} 25\frac{14}{16} \\ -20\frac{7}{16} \\ \hline \end{array}$	$\begin{array}{r} 12\frac{8}{9} \\ -11 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{5}{6} \\ -\frac{5}{6} \\ \hline \end{array}$
4.	$\begin{array}{r} 8\frac{2}{7} \\ -2\frac{1}{7} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{5}{9} \\ -4\frac{2}{9} \\ \hline \end{array}$	$\begin{array}{r} 11\frac{2}{5} \\ -8\frac{2}{5} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{13}{15} \\ -\frac{8}{15} \\ \hline \end{array}$
5.	$\begin{array}{r} 9\frac{10}{11} \\ -8\frac{6}{11} \\ \hline \end{array}$	$\begin{array}{r} 10\frac{8}{14} \\ -4 \\ \hline \end{array}$	$\begin{array}{r} 4\frac{8}{14} \\ -\frac{7}{14} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{8}{9} \\ -\frac{6}{9} \\ \hline \end{array}$

Use with pages 288 and 289.

	a	*b*
1.	$1-\frac{2}{5}=n$	$1-\frac{1}{8}=n$
2.	$1-\frac{5}{32}=n$	$1-\frac{9}{10}=n$
3.	$1\frac{1}{5}-\frac{3}{5}=n$	$1\frac{4}{10}-\frac{5}{10}=n$
4.	$5\frac{3}{16}-\frac{5}{16}=n$	$8\frac{1}{8}-\frac{7}{8}=n$
5.	$6\frac{5}{64}-\frac{9}{64}=n$	$9\frac{3}{14}-\frac{9}{14}=n$

Use with page 291.

	a	*b*	*c*	*d*
1.	$\begin{array}{r} 9\frac{2}{9} \\ -\frac{8}{9} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{4}{11} \\ -1\frac{7}{11} \\ \hline \end{array}$	$\begin{array}{r} 20\frac{2}{25} \\ -4\frac{13}{25} \\ \hline \end{array}$	$\begin{array}{r} 15\frac{1}{12} \\ -11\frac{2}{12} \\ \hline \end{array}$
2.	$\begin{array}{r} 7 \\ -6\frac{6}{7} \\ \hline \end{array}$	$\begin{array}{r} 20 \\ -15\frac{3}{10} \\ \hline \end{array}$	$\begin{array}{r} 11\frac{8}{19} \\ -9\frac{18}{19} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{6}{10} \\ -4\frac{8}{10} \\ \hline \end{array}$
3.	$\begin{array}{r} 8\frac{2}{9} \\ -1\frac{8}{9} \\ \hline \end{array}$	$\begin{array}{r} 14\frac{4}{7} \\ -7\frac{5}{7} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{3}{5} \\ -3\frac{4}{5} \\ \hline \end{array}$	$\begin{array}{r} 13\frac{9}{11} \\ -7\frac{10}{11} \\ \hline \end{array}$
4.	$\begin{array}{r} 7\frac{2}{5} \\ -\frac{4}{5} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{3} \\ -4\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 19 \\ -\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 11\frac{2}{18} \\ -2\frac{5}{18} \\ \hline \end{array}$
5.	$\begin{array}{r} 6\frac{5}{12} \\ -4\frac{7}{12} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{4}{19} \\ -1\frac{5}{19} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{2}{7} \\ -5\frac{4}{7} \\ \hline \end{array}$	$\begin{array}{r} 13\frac{2}{15} \\ -9\frac{4}{15} \\ \hline \end{array}$

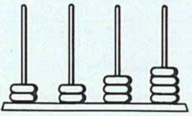
Diagnostic Self-Tests

The tests on pages 319 through 322 of your book will help you and your teacher see how much you have learned in arithmetic. Do each test carefully, and check your work before you give your paper to your teacher.

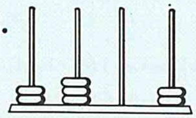
Self-Test 1—The Meaning of Numbers

Write numerals to express the number shown on each abacus below.

1.



2.



Write the numeral that makes each statement below true.

3. 54 is __ tens and __ ones.

4. 543 is __ hundreds, __ tens, and __ ones.

Write the number words that tell the correct way to read each of the following numerals.

5. 4302 as a house number

6. 1492 as a date

Write the following, using numerals and the dollar sign and cents point.

7. Ninety-five cents

8. Seventy dollars and five cents

Write the following as Roman numerals.

9. Twelve **10.** Thirty-nine

Self-Test 2—Addition

Copy each word and sign below that makes you think of the operation of addition.

	a	*b*
1.	addend	difference
2.	−	+
3.	plus	÷
4.	quotient	×
5.	minuend	sum

Write the number of each statement below. After the number write T if the statement is true and F if the statement is not true.

6. When you are adding two numbers, changing the order of the addends changes the sum.

7. Adding 0 to a number changes the number.

8. When three or more addends are to be added, the addends may be regrouped without changing the sum.

9. In adding a column of four numbers, you are to add at least three numbers at a time.

(*Turn the page*)

Self-Test 2 (*continued*)

Copy. Write each sum.

	a	*b*	*c*
10.	576 $+23$	78 $+913$	995 $+64$
11.	864 $+129$	398 $+265$	596 $+769$
12.	5026 $+956$	444 $+6277$	5645 $+988$

Self-Test 3—Subtraction

Write the number of each statement below. Then write T or F to show whether the statement is true or false.

1. Subtraction is just the opposite, or the inverse, of addition.

2. Subtracting 0 from a number changes the number.

3. You check subtraction by adding the minuend to the subtrahend.

4. Subtracting a number from itself results in 0.

Solve each equation below.

	a	*b*
5.	$37-3=n$	$91-8=n$
6.	$99-73=n$	$87-28=n$
7.	$766-78=n$	$320-98=n$
8.	$513-87=n$	$706-189=n$
9.	$681-570=n$	$4876-504=n$

Copy. Write each difference. Check by adding.

	a	*b*	*c*	*d*
10.	539 -438	796 -478	3346 -539	8403 -276
11.	6793 -3478	8850 -3294	8200 -2638	9000 -7698

Self-Test 4—Multiplication

Copy. Write *is equal to* or *is not equal to,* whichever is correct, in place of each blank below.

	a	*b*
1.	9×7 ___ 7×9	0×237 ___ 237
2.	$6+6+6$ ___ 36	$37\div6$ ___ $6\frac{1}{6}$

3. Multiplier times product ___ multiplicand

Solve each equation below.

	a	*b*
4.	$800\times7=n$	$900\times5=n$
5.	$400\times20=n$	$300\times300=n$
6.	$700\times349=n$	$500\times768=n$
7.	$223\times212=n$	$111\times879=n$

Copy. Write each product.

	a	*b*	*c*	*d*
8.	781 $\times200$	467 $\times510$	256 $\times301$	506 $\times450$
9.	478 $\times439$	403 $\times395$	217 $\times379$	338 $\times359$

Self-Test 5—Division

Copy each word and sign below that makes you think of division.

	a	*b*
1.	quotient	−
2.	×	dividend
3.	÷	+
4.	difference	$\overline{)}$
5.	partial product	remainder

Solve each equation below.

	a	*b*
6.	$639 \div 9 = n$	$288 \div 7 = n$
7.	$8000 \div 4 = n$	$9001 \div 3 = n$
8.	$6396 \div 3 = n$	$4887 \div 4 = n$

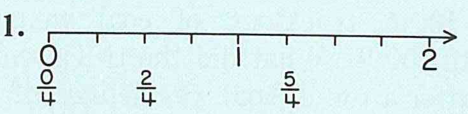
Copy. Write each quotient.

	a	*b*	*c*
9.	$6\overline{)5460}$	$7\overline{)4207}$	$9\overline{)7207}$
10.	$7\overline{)5049}$	$5\overline{)3755}$	$4\overline{)3722}$
11.	$8\overline{)5376}$	$6\overline{)4075}$	$5\overline{)4166}$
12.	$6\overline{)4193}$	$8\overline{)7376}$	$9\overline{)5148}$

Self-Test 6—Fractions

Write the fractions which are needed to complete the scale of the number line below.

1.



Write the pairs of fractions below that are equal in value.

	a	*b*
2.	$\frac{2}{3}$ and $\frac{4}{6}$	$\frac{1}{2}$ and $\frac{6}{9}$
3.	$\frac{3}{4}$ and $\frac{5}{10}$	$\frac{6}{12}$ and $\frac{1}{2}$

Copy. Write each sum in lowest terms.

	a	*b*	*c*
4.	$\begin{array}{r}\frac{1}{10}\\ +\frac{4}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{21}\\ +\frac{4}{21}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{7}\\ +\frac{5}{7}\\ \hline\end{array}$
5.	$\begin{array}{r}\frac{19}{25}\\ +\frac{6}{25}\\ \hline\end{array}$	$\begin{array}{r}\frac{13}{15}\\ +\frac{6}{15}\\ \hline\end{array}$	$\begin{array}{r}\frac{4}{10}\\ +\frac{9}{10}\\ \hline\end{array}$

Copy. Write each difference.

6.	$\begin{array}{r}\frac{5}{10}\\ -\frac{2}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{7}{15}\\ -\frac{3}{15}\\ \hline\end{array}$	$\begin{array}{r}7\frac{8}{9}\\ -\frac{7}{9}\\ \hline\end{array}$
7.	$\begin{array}{r}13\frac{10}{13}\\ -3\frac{7}{13}\\ \hline\end{array}$	$\begin{array}{r}1\\ -\frac{2}{9}\\ \hline\end{array}$	$\begin{array}{r}1\\ -\frac{13}{17}\\ \hline\end{array}$
8.	$\begin{array}{r}1\frac{3}{8}\\ -\frac{6}{8}\\ \hline\end{array}$	$\begin{array}{r}1\frac{1}{16}\\ -\frac{14}{16}\\ \hline\end{array}$	$\begin{array}{r}8\frac{2}{15}\\ -\frac{13}{15}\\ \hline\end{array}$

Self-Test 7—Measures

Write the number of each statement below. Then write T or F to show whether the statement is true or false.

1. The inch is a standard unit of measure.

2. A water pitcher is a standard unit of measure.

(*Turn the page*)

Self-Test 7 (*continued*)

3. A yardstick is equivalent in length to 36 inches.

4. A ton is equivalent to the weight of 1000 pounds.

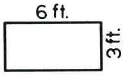
5. By being careful you can find the exact length of any object.

Write each statement below, using words instead of abbreviations. Supply the missing numeral or numerals in each statement.

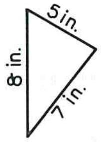
	a	*b*
6.	12 in. = ? ft.	6 yr. = ? mo.
7.	36 in. = ? ft.	5 yd. = ? in.
8.	1 mi. = ? ft.	12 mo. = ? yr.
9.	5 gal. = ? qt.	1 wk. = ? da.
10.	4 pk. = ? bu.	1 yr. = ? wk.

Find the perimeter of each rectangle, triangle, and square below.

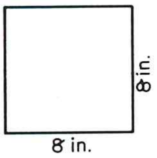
11.



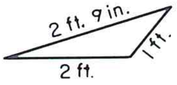
12.



13.



14.



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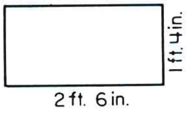


Self-Test 8—Problem Solving

Copy and complete the chart below. Always use the least possible number of coins.

Item	Price	Amount given	Change received					
			$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{100}$
1. Ball	$ .98	$1.00						
2. Movie	.35	.50						
3. Milk	.47	1.00						
4. Bread	.29	1.00						
5. Book	1.19	5.00						

Solve each problem below.

6. What is the perimeter, in feet, of a square field that is 440 yards on each side?

7. Paul and Roger together picked a bushel of beans. They wanted to put them in plastic bags. How many plastic bags could the boys fill, if they put one quart of beans in each bag?

8. Tom arrived at the public library at 12:15. He left at 3:30. How many minutes did Tom spend at the library altogether?

9. For a cookie sale, Mrs. Ray made 5 lb. of cookies on Monday, 3 lb. on Tuesday, and 6 lb. on Wednesday. How many ounces of cookies did she make altogether?

10. A truckload of coal weighed 12,800 lb. What did the truck weigh after a ton of coal was delivered?

HANDBOOK

Many of your questions about arithmetic can be answered by using this handbook. Form the habit of turning to it when you need to review an idea you have studied.

The handbook is easy to use. Its six sections are arranged in alphabetical order. Each section is divided into parts. The numerals in ( ) tell the pages in the book that give more information on the topic.

Addition

The Main Ideas

1. Meaning When you are to think of two numbers as being put together, you should add. (17)

1 and 5, when added, are 6.

2. Words and signs An addition statement contains numerals and signs. (17)

$4+5=9$

$$\begin{array}{rl} 4 & \text{addend} \\ +5 & \text{addend} \\ \hline 9 & \text{sum} \end{array}$$

3. Order of addends The order in which you add makes no difference in the sum. (18)

$2+9=11$ $9+2=11$

4. Checking addition Check addition by adding the addends in another way. (18)

$4+3=7$ $3+4=7$

5. Regrouping When adding three or more numbers, the addends may be grouped in any way without changing the sum. (19)

$7+3+5=n$ may be $(7+3)+5=n$
or $(5+3)+7=n$

6. Zero as an addend Adding 0 to a number or a number to 0 does not change the number. (21)

$$\begin{array}{r} 2 \\ +0 \\ \hline 2 \end{array} \qquad \begin{array}{r} 0 \\ +2 \\ \hline 2 \end{array}$$

How to Add

1. Learn the basic addition combinations Then you will know how to add ones. (17-19)

$$\begin{array}{r} 3 \\ +5 \\ \hline 8 \end{array} \qquad \begin{array}{r} 7 \\ +5 \\ \hline 12 \end{array}$$

2. Use the basic addition combinations Add tens, hundreds, and thousands in the same way as ones. (25, 28, 30)

$$\begin{array}{r} 75 \\ +22 \\ \hline 97 \end{array} \qquad \begin{array}{r} 164 \\ +425 \\ \hline 589 \end{array} \qquad \begin{array}{r} 3615 \\ +2143 \\ \hline 5758 \end{array}$$

3. Make changes in form When the sum in any place-value position is greater than 9, take the same steps as used in adding ones. (25, 28, 30)

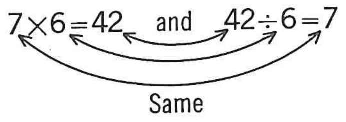
a. Change the form of 10 ones to 1 ten.
b. Write ones (remaining) in ones place.
c. Remember the tens.
d. Add the tens (remembered) to the tens.

$$\begin{array}{r} 52 \\ +29 \\ \hline 81 \end{array} \qquad \begin{array}{r} 68 \\ +81 \\ \hline 149 \end{array} \qquad \begin{array}{r} 824 \\ +465 \\ \hline 1289 \end{array} \qquad \begin{array}{r} 9345 \\ +2424 \\ \hline 11769 \end{array}$$

Division

The Main Ideas

1. Meanings Division undoes what multiplication does. (80, 98)



2. Words and signs Equations consist of numerals and signs. (77)

$$10 \div 2 = 5 \qquad \begin{array}{rl} 5 & \text{quotient} \\ \text{divisor } 2\overline{)10} & \text{dividend} \end{array}$$

3. Using 1 in division Dividing a number by itself results in a quotient of 1, and dividing a number by 1 does not change the number. (79)

$$2 \div 2 = 1 \qquad 5 \div 1 = 5$$

4. Using 0 in division The quotient of 0 divided by a number is 0. (80)

$$\begin{array}{r} 0 \\ 5\overline{)0} \end{array} \qquad \begin{array}{r} 0 \\ 7\overline{)0} \end{array}$$

5. Zero and non-zero remainders A remainder is a number less than the divisor. Write a remainder other than zero beside the quotient. (90)

$$\begin{array}{r} 2 \\ 5\overline{)10} \\ -\underline{10} \\ 0 \end{array} \qquad \begin{array}{r} 5\text{ r}1 \\ 2\overline{)11} \\ -\underline{10} \\ 1 \end{array} \qquad \begin{array}{r} 5\tfrac{1}{2} \\ 2\overline{)11} \\ -\underline{10} \\ 1 \end{array}$$

How to Divide One-, Two-, and Three-Digit Numbers

1. Learn the basic division combinations Then you will know how to divide ones. (77-79, 84-87)

$$6 \div 2 = 3 \qquad 72 \div 9 = 8$$

2. Use the basic division combinations Divide tens and hundreds in the same way as ones: Divide, multiply, and subtract. (103, 192)

$$\begin{array}{r} 34 \\ 2\overline{)68} \\ \underline{6} \\ 8 \\ \underline{8} \end{array} \qquad \begin{array}{r} 132 \\ 3\overline{)396} \\ \underline{3} \\ 9 \\ \underline{9} \\ 6 \\ \underline{6} \end{array}$$

3. Make changes in form Whenever the remainder in any place-value position, except ones place, is not 0 but is less than the divisor, take the same steps as those used in changing tens to ones. (108, 194-197)

- **a.** Think of 1 hundred as 10 tens. Add them to the tens.
- **b.** Divide the tens. Multiply and subtract.
- **c.** Divide the ones. Multiply and subtract. Write the remainder if it is other than 0.

$$\begin{array}{r} 25\text{ r}1 \\ 3\overline{)76} \\ \underline{6} \\ 16 \\ \underline{15} \\ 1 \end{array} \qquad \begin{array}{r} 40 \\ 4\overline{)160} \\ \underline{16} \\ 0 \\ \underline{0} \end{array} \qquad \begin{array}{r} 77 \\ 6\overline{)462} \\ \underline{42} \\ 42 \\ \underline{42} \end{array} \qquad \begin{array}{r} 121 \\ 8\overline{)968} \\ \underline{8} \\ 16 \\ \underline{16} \\ 8 \\ \underline{8} \end{array}$$

How to Divide Four-Digit Numbers

1. Divide thousands by ones as you divide ones, tens, or hundreds by ones as shown in the chart at the top of the second column (205)

8÷4=2	8 O ÷ 4 O = 2 O
80÷4=20	8 T ÷ 4 O = 2 T
800÷4=200	8 H ÷ 4 O = 2 H
8000÷4=2000	8 Th ÷ 4 O = 2 Th

2. Make changes in form Whenever the remainder in any place-value position, except ones place, is not 0 but is less than the divisor, take the same steps as those that you use in changing hundreds to tens. (206, 207, 208)

- **a.** Think of 1 thousand as 10 hundreds. Add them to the hundreds.
- **b.** Divide the hundreds. Multiply and subtract.
- **c.** Divide the tens. Multiply and subtract.
- **d.** Divide the ones. Multiply and subtract. Write the remainder if it is other than 0.

$$\begin{array}{r} 3213 \\ 3\overline{)9639} \end{array} \qquad \begin{array}{r} 910 \\ 3\overline{)2730} \\ \underline{27} \\ 3 \\ \underline{3} \\ 0 \\ \underline{0} \end{array} \qquad \begin{array}{r} 951 \\ 7\overline{)6657} \\ \underline{63} \\ 35 \\ \underline{35} \\ 7 \\ \underline{7} \end{array}$$

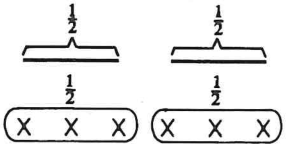
Fractions

The Main Ideas

1. Meaning You use a fraction to name a part of one object or to name part of a group of objects. (151)

One half of an inch

One half of a group of 6



2. Words and signs A fraction is written by using two numerals, one above the other, with a short line called the fraction line between them. The top numeral is the numerator; the bottom numeral is the denominator. (151, 264)

$\frac{1}{2} \quad \frac{2}{2} \quad \frac{3}{2} \quad \frac{4}{2}$

3. Kinds of fractions Fractions may be thought of as proper, improper, or mixed. (154, 160)

$\frac{2}{3}$ (proper) $5\frac{2}{3}$ (mixed)
$\frac{4}{3}$ (improper) $\frac{4}{4}$ (improper)

4. Changes in form The form of a fraction may be changed. (163-167, 267)

$\frac{3}{4}=\frac{6}{8}$	Multiply $\frac{3}{4}$ by $\frac{2}{2}$.
$\frac{3}{12}=\frac{1}{4}$	Divide $\frac{3}{12}$ by $\frac{3}{3}$.
$\frac{7}{3}=2\frac{1}{3}$	Divide 7 by 3.
$3\frac{5}{6}=\frac{23}{6}$	Change 3 to $\frac{18}{6}$. Add $\frac{5}{6}$ to $\frac{18}{6}$.

How to Find a Fractional Part of a Number

Divide the number by the denominator of the fraction. Multiply by the numerator, if it is greater than 1 (156, 158)

$\frac{1}{2}$ of 8 becomes $8 \div 2$ or 4
$\frac{2}{3}$ of 12 becomes $2 \times (12 \div 3)$ or 8

How to Add Fractions

1. Fractions with common denominators Add thirds to thirds in the same way as you add ones to ones. (265, 268, 269, 271, 272)

a. $\frac{1}{3}+\frac{1}{3}=\frac{1+1}{3}=\frac{2}{3}$
b. $\frac{2}{3}+\frac{2}{3}=\frac{2+2}{3}=\frac{4}{3}=1\frac{1}{3}$

Add the numerators. Write their sum over the denominator.
Change to lowest terms.

2. Mixed fractions In column form, first add the fractional numbers and then add the whole numbers. Make changes in form whenever possible. (275, 276)

a.
$$\begin{array}{r} 2\frac{1}{3} \\ +4\frac{1}{3} \\ \hline 6\frac{2}{3} \end{array}$$
Add the thirds. Write the thirds. Write the ones.

b.
$$\begin{array}{r} 5\frac{1}{4} \\ +\frac{1}{4} \\ \hline 5\frac{2}{4}=5\frac{1}{2} \end{array}$$
Add the fourths. Write the fourths. Write the ones.
Change the form of $\frac{2}{4}$ to $\frac{1}{2}$.

How to Subtract Fractions

1. Fractions with common denominators Subtract thirds from thirds in the same way as you subtract ones from ones. (283, 284)

$\frac{2}{3}-\frac{1}{3}=\frac{1}{3}$ Subtract the numerators. Write their difference over the denominator. Change to lowest terms.

2. Mixed fractions In column form, first subtract the fractional numbers and then subtract the whole numbers. (286, 289, 290)

a.
$$\begin{array}{r} 4\frac{2}{3} \\ -\frac{1}{3} \\ \hline 4\frac{1}{3} \end{array}$$
Subtract the fractions. Write the difference, $\frac{1}{3}$. Write 4.

b.
$$\begin{array}{r} 5\frac{7}{8} \\ -1\frac{1}{8} \\ \hline 4\frac{6}{8}=4\frac{3}{4} \end{array}$$
Subtract the fractions. Write the difference, $\frac{6}{8}$.
Subtract the ones. Write the ones.
Change the fraction to lowest terms.

c.
$$\begin{array}{rcr} 1\frac{1}{3}=\frac{3}{3}+\frac{1}{3}= & & \frac{4}{3} \\ -\frac{2}{3} & & -\frac{2}{3} \\ \hline & & \frac{2}{3} \end{array}$$
Change the form of $1\frac{1}{3}$ to $\frac{4}{3}$.
Subtract the fractions. Write the difference, $\frac{2}{3}$.

Multiplication

The Main Ideas

1. Meaning Multiplication is a way of doing repeated addition. (57)

$$2+2+2+2+2=10$$
$$5\times2=10$$

2. Words and signs A statement contains numerals and signs. (57)

$5\times2=10$

$$\begin{array}{rl} 2 & \text{multiplicand} \\ \times5 & \text{multiplier} \\ \hline 10 & \text{product} \end{array}$$

3. Order of numbers being multiplied The order in which you multiply two numbers makes no difference in the product. (59, 60, 224)

$5\times6=30 \qquad 6\times5=30 \qquad 5\times6=6\times5$

4. Using 1 in multiplication Multiplying a number by 1 or multiplying 1 by a number does not change the number. (59)

$1\times2=2 \qquad 9\times1=9$

5. Using 0 in multiplication The product of 0 and another number is always 0. (61)

$4\times0=0 \qquad 0\times8=0$

How to Multiply by a One-Digit Number

1. Learn the basic multiplication combinations Then you will know how to multiply ones. (59, 64-66)

$2\times4=8 \qquad 9\times8=72$

2. Use the basic multiplication combinations Multiply tens, hundreds, and thousands in the same way as ones. (62, 69, 176)

$$\begin{array}{r} 21 \\ \times4 \\ \hline 84 \end{array} \qquad \begin{array}{r} 144 \\ \times2 \\ \hline 288 \end{array} \qquad \begin{array}{r} 2434 \\ \times2 \\ \hline 4868 \end{array}$$

3. Make changes in form When the partial product in any place-value position is greater than 9, multiply as you multiply ones. (62, 63, 70, 177)

a. Change the form of each 10 ones to 1 ten.
b. Write the ones (remaining) in ones place.
c. Remember the tens. Multiply the tens.
d. Add the tens (remembered) to the product of the tens.
e. Change the form of hundreds and thousands and so on, as needed.

$$\begin{array}{r} 28 \\ \times3 \\ \hline 84 \end{array} \qquad \begin{array}{r} 61 \\ \times5 \\ \hline 305 \end{array} \qquad \begin{array}{r} 322 \\ \times4 \\ \hline 1288 \end{array} \qquad \begin{array}{r} 8323 \\ \times3 \\ \hline 24969 \end{array}$$

How to Multiply by a Two-Digit Number

1. Multiply ones by tens as you multiply ones by ones (179)

$1\times5=5$ 1 ten × 5=5 tens or 50
$2\times5=10$ 2 tens × 5=10 tens or 100

2. Multiply tens by tens as you multiply ones by ones The product will be in hundreds. (180)

$10\times20=200$ 1 ten × 2 tens=2 hundreds
$20\times20=400$ 2 tens × 2 tens=4 hundreds

3. Multiply by the ones and then by the tens (181)

0 O × 4 O = 0 O =
0 O × 2 T = 0 T =
1 T × 4 O = 4 T =
1 T × 2 T = 2 H =

$$\begin{array}{r|r|r} \text{H} & \text{T} & \text{O} \\ & 2 & 4 \\ \times & 1 & 0 \\ \hline & & 0 \\ & 0 & 0 \\ & 4 & 0 \\ 2 & 0 & 0 \\ \hline 2 & 4 & 0 \end{array} \qquad \begin{array}{r} 24 \\ \times 10 \\ \hline 240 \end{array}$$

4. Make changes in form when the product in any place-value position is greater than 9 (182, 183, 185)

$$\begin{array}{r} 24 \\ \times 12 \\ \hline 48 \\ 24 \\ \hline 288 \end{array} \qquad \begin{array}{r} 48 \\ \times 12 \\ \hline 96 \\ 48 \\ \hline 576 \end{array} \qquad \begin{array}{r} 24 \\ \times 43 \\ \hline 72 \\ 96 \\ \hline 1032 \end{array}$$

5. Check by changing the order of the numbers you are multiplying and multiply again (224)

29×27=783 27×29=783

How to Multiply by a Three-Digit Number

1. Multiply ones by hundreds as you multiply ones or tens by ones (225)

2×3=6 20×3=60
200×3=600 2 H×3 O=6 H

2. Multiply tens by hundreds as you multiply tens by ones (226)

200×60=12000 2 H × 6 T = 12 Th

3. Multiply hundreds by hundreds as you multiply hundreds by ones (226)

300×600=180000 3 H × 6 H = 18 TTh

4. Make changes in form whenever necessary (228, 229)

$$\begin{array}{r} 213 \\ \times 122 \\ \hline 426 \\ 426 \\ 213 \\ \hline 25986 \end{array} \qquad \begin{array}{r} 237 \\ \times 175 \\ \hline 1185 \\ 1659 \\ 237 \\ \hline 41475 \end{array}$$

Problem Solving

The Main Ideas

1. Story problems A story problem asks a question that can be answered by using one or more of these operations: addition, subtraction, multiplication, or division. (133)

2. Solving story problems Write each problem as an equation. Solve the equation. Write the answer to the problem. (133)

How to Solve Story Problems

1. Addition When you are to think of groups, or sets, as being joined, add the numbers of the sets. (47, 73, 178, 279)

Jerry has read 90 pages in a book. He has 34 more pages to read. How long is the book?

90+34=n 90+34=124

Jerry's book has 124 pages.

2. Subtraction When you are to take a set apart or to find by how many one set is greater than another, you subtract the numbers of the sets. (47, 73, 178, 279)

Jane's book has 96 pages in it. She has read 19 pages. How many more pages does she have to read?

$19+n=96 \qquad 96-19=n \qquad 96-19=77$

Jane has to read 77 pages more.

3. Multiplication When you are to join groups, or sets, of equal size, you multiply the numbers. (73, 106, 178, 279)

Mrs. Brown bought 4 loaves of bread for sandwiches. If she made 14 sandwiches from each loaf, how many sandwiches could she make in all?

$4\times14=n \qquad 4\times14=56$

She could make 56 sandwiches.

4. Division When you are to separate a set into sets of equal size, you divide the numbers. (106, 178, 279)

Mr. Brown bought 48 bottles of pop, with 6 bottles in each carton. How many cartons did he buy?

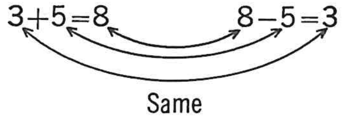
$48\div6=n \qquad 48\div6=8$

He bought 8 cartons of pop.

Subtraction

The Main Ideas

1. Meanings Subtraction undoes what addition does. (33, 77)



2. Words and signs A subtraction statement contains numerals and signs. (33)

$8-5=3$

$$\begin{array}{rl} 8 & \text{minuend} \\ -5 & \text{subtrahend} \\ \hline 3 & \text{difference} \end{array}$$

3. Zero in subtraction The difference is 0 whenever the minuend and the subtrahend in a subtraction are the same. When you subtract 0 from a number, you do not change the number. (37, 40)

$5-5=0 \qquad 5-0=5$

4. Checking You check subtraction by using addition. (41)

$36-4=32 \qquad 32+4=36$

How to Subtract

1. Learn the basic subtraction combinations Then you will know how to subtract ones. (33-37)

$$\begin{array}{r} 9 \\ -5 \\ \hline 4 \end{array} \qquad \begin{array}{r} 17 \\ -9 \\ \hline 8 \end{array} \qquad \begin{array}{r} (\ 17\ \text{ones}) \\ (-9\ \text{ones}) \\ \hline (\ \ 8\ \text{ones}) \end{array}$$

2. Use the basic subtraction combinations Subtract tens, hundreds, and thousands in the same way as ones. (42, 50, 52)

$$\begin{array}{r} 69 \\ -35 \\ \hline 34 \end{array} \qquad \begin{array}{r} 637 \\ -212 \\ \hline 425 \end{array} \qquad \begin{array}{r} 4986 \\ -2143 \\ \hline 2843 \end{array}$$

3. Make changes in form Whenever any digit in the subtrahend is greater than the corresponding digit in the minuend, take the same steps as those used in subtracting ones. (41, 42, 50, 54)

a. Change the form of 1 ten to 10 ones.
b. Add the 10 ones to the ones in the minuend.
c. Subtract the ones.
d. Change form elsewhere as needed.

$$\begin{array}{r} 61 \\ -46 \\ \hline 15 \end{array} \qquad \begin{array}{r} 816 \\ -354 \\ \hline 462 \end{array} \qquad \begin{array}{r} 9738 \\ -4925 \\ \hline 4813 \end{array}$$

Tables of Measure

Linear Measure

12 inches (in.) = 1 foot (ft.)
36 inches (in.) = 1 yard (yd.)
3 feet (ft.) = 1 yard (yd.)
5280 feet (ft.) = 1 mile (mi.)
1760 yards (yd.) = 1 mile (mi.)

Liquid Measure

2 measuring cups (c.) = 1 pint (pt.)
2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)

Weight

16 ounces (oz.) = 1 pound (lb.)
2000 pounds (lb.) = 1 ton (T.)

Calendar

7 days (da.) = 1 week (wk.)
12 months (mo.) = 1 year (yr.)
52 weeks (wk.) = 1 year (yr.)
365 days (da.) = 1 year (yr.)
366 days (da.) = 1 leap year (yr.)

Time

60 seconds (sec.) = 1 minute (min.)
60 minutes (min.) = 1 hour (hr.)
24 hours (hr.) = 1 day (da.)

Dry Measure

2 pts. (pt.) = 1 quart (qt.)
8 quarts (qt.) = 1 peck (pk.)
4 pecks (pk.) = 1 bushel (bu.)

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